

OCCUPATIONAL
PSYCHOLOGY

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JUBILEE VOLUME

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OCCUPATIONAL PSYCHOLOGY

JUBILEE VOLUME

Volume 44, 1970

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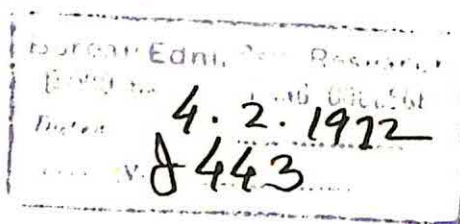
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14 Welbeck Street, London, W1M 8DR



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Occupational Psychology is published quarterly by the National Institute of Industrial Psychology. From January 1932 to December 1937 the Institute's Journal appeared monthly under the title *The Human Factor*; from January 1922 to December 1931 it appeared quarterly under the title of *The Journal of the National Institute of Industrial Psychology*. The National Institute of Industrial Psychology is a scientific association whose aim is the development of occupational psychology in Great Britain. Particulars of its work and information about membership can be obtained on application to the Secretary, NIIP, 14 Welbeck Street, London, W1M 8DR.

OCCUPATIONAL PSYCHOLOGY

1970 VOL. 44

JUBILEE VOLUME

EDITORIAL

This special volume of OCCUPATIONAL PSYCHOLOGY marks the fiftieth anniversary of the founding of the National Institute of Industrial Psychology. Although dated 1970 it appears in 1971; decisions about establishing the Institute were taken in 1920 and it was formally incorporated in 1921. The volume has two main objects: to pay tribute to our founder, Charles Myers, and to illustrate the work and thinking of occupational psychologists in Great Britain today.

Myers' remarkable foresight is difficult to appreciate now when so many of the ideas he strove to introduce have become widely accepted. His lecture entitled Psychology and Industry delivered in 1919 and reprinted here should be read with this perspective. Early struggles for recognition and support are described in excerpts reprinted from his autobiography and from memorial lectures by Professors Bartlett and Rodger. Papers contributed by C. B. Frisby, Winifred Raphael and D. F. Vincent, all of whom spent most of their working lives providing, developing or directing the Institute's studies and services, show in their different ways and within the editorial limits imposed on them how the work begun by Myers has grown and spread.

Contributions by present members of the Institute's staff give some current ideas on perennially important topics such as the prevention of industrial accidents, vocational guidance and career development, and show concern for matters of growing importance such as preservation of the right to privacy, training and professional standards in occupational psychology, and the proper design, conduct and interpretation of studies of people at work. Representatives of government services comment on the occupational psychologist's role in them, and academic research workers venture forecasts of future developments.

The half century's growth of occupational psychology under the aegis of the Medical Research Council is described in papers by Brown and others Marriott and Sergeant. To give a comprehensive account of all U.K. developments, for example at Aston, Birkbeck, Cardiff, Edinburgh, Liverpool and increasingly at other universities, much less of those in Europe and elsewhere, was beyond our intended scope. A brief review of the position of psychologists in industry in the United States, the United Kingdom and Western Germany was given by Dr Ivan McCollom in *The American Psychologist* in December 1959 and January 1960.

In response to numerous requests, we have taken the opportunity to reprint articles from past issues of our journal. Choice has been difficult in the extreme; we have selected papers for their current relevance as well as intrinsic quality, and mostly from before 1950 because these are most likely to have escaped the notice of today's readers.

Our hope of representing in this volume most of the topical concerns and current activities of our U.K. colleagues proved too ambitious; several writers were unable to complete papers in the time available. Subjects we have regretfully omitted but on which we hope to publish later concern executive job analysis and evaluation; rating and appraisal systems; the use of tests in executive selection; and training, both as developed by psychologists for industrial and commercial application and as provided for them by universities and colleges. Field training is briefly discussed by the Institute's present director.

Grateful acknowledgement is offered to all who have written specially for this volume, sometimes under grave handicap and always at only a few months' notice; to members of the editorial advisory panel and others who have encouraged the effort; to those who have shared the practical hard work of initial selection of papers for reprinting and of editing, especially Christine Chin and Margaret Grainger; and to those who have typed and re-typed manuscripts and shared in proof reading. The merits of the volume are theirs; the faults the editor's.

I.J.B.

OCCUPATIONAL PSYCHOLOGY

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Vol. 44

CONTENTS

Editorial	iii
CHARLES S. MYERS (1919)	
Psychology and Industry	1
CHARLES SAMUEL MYERS (1936)	
Autobiography	5
F. C. BARTLETT (1965)	
Remembering Dr. Myers	15
ALEC RODGER (1971)	
C. S. Myers in Retrospect	23
ERIC FARMER (1958)	
Early Days in Industrial Psychology: an autobiographical note	31
C. B. FRISBY (1971)	
The Development of Industrial Psychology at the NIIP ..	35
NIIP (1971)	
Some Publications of the NIIP and its Staff	51
WINIFRED RAPHAEL (1971)	
NIIP and its Staff 1921 to 1961	63
D. F. VINCENT (1971)	
Problems of Test Production and Supply	71
DAVID COX (1971)	
Organization of Repetitive Tasks: some shop floor experiments recalled	81
R. B. BUZZARD (1968)	
Field Training in Occupational Psychology	89
J. W. TOPLIS (1971)	
Studying People at Work: outline of a system	95
A. R. HALE and M. HALE (1971)	
Accidents in Perspective	115
JOHN NUTTALL (1971)	
Methods and Results in Occupational Psychology	123
J. H. B. DODD (1971)	
Privacy and the Occupational Psychologist	137
CYRIL BURT (1924)	
The Mental Differences between Individuals	141
L. S. HEARNshaw (1942)	
The Unity of Industrial Psychology	149

WINIFRED RAPHAEL (1944)	
A Technique for Surveying Employees' Opinions and Attitudes	157
NIGEL BALCHIN (1947)	
Satisfactions in Work	165
C. A. MACE (1948)	
Satisfactions in Work	175
JOHN PARRY (1951)	
The Psychological Adviser's Problems	187
J. G. W. DAVIES (1950)	
What is Occupational Success?	195
M. B. STOTT (1950)	
What is Occupational Success?	205
JOAN WYNN REEVES (1950)	
What is Occupational Success?	213
JOAN WYNN REEVES (1970)	
What is Occupational Success? Postscript 1970	219
J. G. W. DAVIES (1970)	
What is Occupational Success? Postscript 1970	221
RUTH D. LANCASHIRE and BARBARA J. COHEN (1971)	
Developments in Vocational Guidance	223
G. C. WHITE, L. H. RAPHAEL and J. CRINNION (1971)	
Vocational Guidance at the Department of Employment: the work of psychologists	229
JOHN DONALD (1971)	
Psychologists in the Prison Service	237
JOHN PARRY (1971)	
The Developing Role of the Service Psychologist	245
R. MARRIOTT (1958)	
The Medical Research Council Industrial Psychology Research Group	253
R. SERGEAN (1971)	
The Medical Research Council Industrial Psychology Research Unit 1958-1967	261
I. D. BROWN, V. BATTS and C. E. McGOUGAN (1970)	
The Medical Research Council Applied Psychology Unit	267
R. CONRAD (1967)	
Beyond Industrial Psychology	281
HARRY KAY and PETER WARR (1971)	
Some Future Developments in Occupational Psychology	293
R. B. BUZZARD (1970)	
Professional Registration of Occupational Psychologists: separate or conjoint?	303

PSYCHOLOGY AND INDUSTRY*

CHARLES S. MYERS

PSYCHOLOGY must be ranked to-day (1917) among the natural sciences, standing in the same relation to the living mind as biology stands to living matter. Biology, as is well known, has been served by two different methods of approach. There is the older 'observational' method, which has been employed in such general problems as natural selection, variation and adaptation, and in compiling the natural history of living organisms—their development, their generic, specific, individual and sexual differences, etc. And there is the 'experimental' method, which, in conjunction with the former method, has given rise to physiology, pathology, genetics, etc.; these have rapidly advanced to the position of applied sciences in relation to such disciplines as medicine, human and veterinary, and eugenics, animal and vegetable.

In its earliest days biology was a field of study for philosophers, who employed both the observational and the experimental methods of approach. Psychology, on the other hand, is only just emancipating itself from the tutelage of philosophy. In psychology we can likewise distinguish the observational method, which has helped to reveal to us the natural history of mind, from the later experimental methods which have been characterized by a more thorough knowledge and a more perfect control of attendant conditions, and by a more complete freedom from metaphysical preconceptions and aims. The effects produced by varying conditions upon mental experience (or introspection) and upon bodily expression (or behaviour) have come to be studied in the laboratory, where those conditions can be simplified or complicated at will. Advantage has also been taken of nature's own variation of such conditions, as in the clinical and laboratory study of individual mental differences, normal and abnormal, of excess or defect, including those produced by disorder, disease or injury, racial mental differences, e.g. the mental differences between the higher and lower races, and generic mental differences, e.g. the mental differences between the sensations, intelligence, instincts, etc., of man and animals, of vertebrates and insects, and so on.

Still more recently another stage in the evolution of psychology has been reached by the systematic study of unconscious processes and of their relations to consciousness. Whereas the earlier philosophical psychology, and the experimental school which arose from it, had been mainly

*A shortened version of the inaugural address to the first meeting of the Industrial Section of the British Psychological Society, 25 April 1919. Reprinted, with permission, from the *British Journal of Psychology*, 1920, 10, 177-182.

intellectualistic, giving undue prominence to the play of reason, this later stage has been characterized by the emphasis it lays on the importance of instinct and the emotions, and by its devotion to the study of unconscious processes.

As in the case of biology, the results obtained from experimental psychological methods, and indeed those methods themselves, have begun to be applied to practical purposes—first to education, next to medicine, and most recently to industry, thus creating three applied sciences, those of educational, medical and industrial psychology; and the British Psychological Society is now instituting three special sections of the Society which are to be respectively devoted thereto.

In industry (including commerce) there are four main themes to which psychology can be profitably applied, namely to fatigue, movement study, vocational guidance and management.

Fatigue has long been a subject of research both by physiologists and by psychologists. The physiologist has generally investigated it under the simplest experimental conditions. For example, he has isolated a single muscle of a frog from the body, and has studied the phenomena of fatigue produced in it by electrical stimulation of the muscle or of its nerve, and the effects of varying the strength and frequency of stimulation, the surrounding temperature, the weight lifted by the muscle, etc. He has also investigated the effects of muscular exercise on the general metabolism of the organism. The psychologist, on the other hand, has conducted exclusively 'human' experiments, treating the organism as a whole. He has approached the problem from the standpoint of mental as well as muscular fatigue. He has devised tests of mental fatigue, constructing work curves of mental output, and analysing the psychological factors involved therein, such as spurt and practice, in turn analysing the latter into its psychological components. He has studied the effects of drugs, e.g. of tea, coffee, strychnine and alcohol, on mental and muscular fatigue. He has examined the effects of rest pauses of different length, introduced after varying periods of work, on mental efficiency. He has shown the unreliability of certain interpolated tests as evidence of muscular or mental fatigue; he has shown the importance of a rigorous, precise training in the methods of experimental psychology, in order to avoid the pitfalls incidental to human experiment; and he has so prepared the way for a systematic investigation of the more important problems of industrial fatigue that future success must depend on intimate psychological and physiological co-operation.

Movement study has as yet been scarcely touched by the psychologist. It has hitherto been mainly the purview of the industrial 'efficiency expert'. But there is obviously a vast field of promising psychological research here. The present methods are largely empirical and guess-work. The expert pays a visit to a factory where he sees a worker making a series of seemingly needless movements. He believes that time would be saved by training the worker to another, an apparently 'shorthand', method. He tries it and, we will suppose, he finds that time is saved by its adoption. He assumes that, because a speedier method has been devised, there is no increase, or there is

a decrease, of fatigue. He assumes that because this method is found to suit one worker, it is therefore the one and best method, always to be adopted by all workers. Clearly there are numerous problems for psychological experiment here, by which the applied science of industrial psychology will be advanced to surer ground. Similar scientific work is needed to yield reliable information in regard to other matters which are intimately connected with movement study, e.g. the optimal load and posture, the optimal rate and frequency of lift, etc., in persons of different muscular power, age and sex.

The study of vocational guidance is founded on that of individual differences, for the basis of which we are indebted to pure experimental psychology. Some of the earliest psychological experiments on reaction time were devoted to a study of the individual differences observed. The advantages of selecting employees in the case of certain occupations according to their speed of reaction have been shown. Similar results have followed from the application of psychological tests to the selection of applicants for telephone-exchange work in America. It is obvious that their hearing, vision, speech, memory for figures, memory for the order of instructions received, and their speed and accuracy of reaction to signals are readily capable of experimental estimation.

Psychological tests of foresight are also capable of construction, and have actually been applied with success in investigations on motor tram-drivers. A very close inverse relation was found to obtain between the degree of a driver's success in the laboratory test and the number of accidents recorded against him during his every-day work.

Tests of the accuracy and speed of reasoning have also been devised. Tests of general information have been frequently employed. These and other tests are about to be used at Columbia University, New York, in place of the Matriculation Examinations, so as to select those who can best profit by a university career.

During the last year of the 1914-18 war, I happened to be concerned in the selection of candidates for training in hydrophone-listening for hostile submarines. Tests were devised for keenness of hearing, accuracy of sound discrimination, memory for pitch, rhythm and quality of sound, power to discriminate between different pitches, rhythms and qualities, general accuracy, general information, ability to grasp complicated instructions, etc. The result of the application of such tests was that the training authorities reported that the first batch of lads we sent them was far away the best they had ever received, and that the next batch was even better still!

It is perfectly clear that by the aid of properly devised tests applied by properly trained persons those leaving school could be materially helped and usefully advised in their choice of a suitable vocation, and that by their application to candidates for any industrial or commercial post the fittest could be speedily selected.

Under the application of psychology to management, I include the consideration of the psychological causes of industrial discontent and restricted output, the psychological advantages of different methods of

payment and supervision, and other conditions which affect the efficiency and the happiness of the workers. During the last few years a flood of light has been thrown on the importance of the emotions and on the changes which they effect and to which they are subject. We now recognize how prone we are to rationalize, i.e. to give an intellectual reason for actions which are really prompted by emotional states, or by subtler influences which are unknown to us or which for good reasons dare not be faced. We now recognize that in order to avoid causing excessive self-depreciation an emotion may undergo a process of 'projection'. Thus instead of reproaching ourselves we may attribute the reproach to others; hence arise delusions of suspicion and even persecution. Or, for the same purpose, an emotion may be 'inverted', e.g. shyness becoming concealed by an affected boisterousness, the desire for a person of the opposite sex by aversion, submissiveness by defiance. We understand now more fully the psychological basis of worry and anxiety, the importance of their early treatment, and the psychotherapy of the functional nervous disorders to which, if unresolved, they may give rise. The application of such new advances to the problems of industrial unrest is sufficiently obvious.

CHARLES SAMUEL MYERS

AUTOBIOGRAPHY

I WAS BORN IN LONDON on the confines of Bayswater and Notting Hill on March 13th, 1873. My father (one of nine brothers and sisters), both my grandfathers, and my four great-grandfathers were all business men in or near London. My mother (one of 15 brothers and sisters) was wonderfully sociable and had exceptional powers of musical expression and pianoforte technique; one of her brothers was attracted in an amateur way to philosophical and historical studies; a third, who founded a successful firm of solicitors, gathered in his leisure hours a celebrated (the Montagu) collection of coins. Two of my father's brothers spent their later bachelor life in travelling, one of them devoting himself to Egyptology.

Thus perhaps I can account for my interests in organizing and in humanity, my love of music, my enjoyment of travelling, and my attraction to archaeology. But I can find little hereditary basis for my early attraction either to literary composition or to chemistry—a subject then taught to all pupils save in the lowest forms of the City of London School, which I entered at 11 years of age. I remember buying for myself pieces of phosphorus and sodium at about the age of 12, throwing the latter into water and the former into a vessel of oxygen in the basement kitchen of my London home, and nearly injuring the cook and myself by the accidental explosion of a hydrogen-making apparatus which I had made from purchased parts. At 13 I constructed a cylindrical frictional electrical machine out of a wine-bottle. Meanwhile at school I kept to a mainly classical curriculum, gaining prizes in English composition and showing such promise in Latin prose and verse that my classical composition master bade me hesitate, when at the age of 16 my candidature for a Cambridge entrance scholarship came under consideration, whether I should offer classics or natural science.

Indeed, my first hard conflict arose at this juncture. As his eldest son, I knew that my father would have liked me to enter his business. But as a wise father, he bade me to consider myself at full liberty to make my own choice. I decided to try for a scholarship in natural science at Gonville and Caius College in 1891. But my science master at school knew little biology and less physiology, and in the private tuition which he gave me I used to find him reading my textbook in physiology (Michael Foster's) so as to keep

This article is taken from *A History of Psychology in Autobiography*: Volume III, 215–230. (Murchison, Carl A., ed. Worcester, Mass.: Clark University Press, 1936; reprinted New York: Russell and Russell, 1961.)

just ahead of me. I left school in 1890 and joined a year's course in elementary biology, chemistry, and physics at St. Bartholomew's Hospital. Thus, hurriedly and poorly equipped, I gained an entrance exhibition, and soon after a foundation scholarship at Caius.

My idea when I entered Cambridge University in 1891 was to prepare for the medical profession. I spent my first two years there in working at chemistry, physics, botany, zoology, and physiology, becoming especially attracted to botany (in which I gained a College prize) and most of all to physiology. In my second two years (1893-1895) of undergraduate life, I specialized in physiology and human anatomy. The latter, as then taught for the second part of the Natural Sciences Tripos, was a subject of remarkably wide scope. As Sir Michael Foster once said, "The whole subject of comparative religion forms but a small part of Cambridge human anatomy!" Fired by my teacher Dr A. C. Haddon's enthusiasm, I became specially interested in physical and racial anthropology. Before I took my B.A. degree in 1895, I had already begun investigations (published in 1897 in the *Journal of the Anthropological Institute*) on a recent find of ancient skulls in a field near Brandon in Suffolk. I also remember deducing, in my undergraduate days, from a table of angles of torsion of the humerus set out in an American publication on certain ancient Mexican skeletons, that this particular people must have been left-handed—only a few years later to find that, from an examination of certain Mexican pottery, the supposition had been entertained that it had been made by a left-handed people.

The first piece of organization for which I remember myself responsible was concerned with amateur theatricals at the age of about 15. At Cambridge much of my undergraduate leisure time was spent in reorganizing the University Musical Club devoted to the amateur performance of chamber music, in which, as violinist, I took a prominent part. I had already dipped into epistemology and the history of philosophy during and even before my undergraduate years at Cambridge.

On leaving Cambridge, I had no idea as to my future career. Certainly I felt disinclined to medical practice. My main interests were by then divided between anthropology and experimental psychology. When Dr W. H. R. Rivers was officially attached to the Special Board for Moral Science, and gave lectures at the University both on the senses and on experimental psychology, holding a practical course in both subjects in a small room lent to him by Sir Michael Foster in the physiological laboratory, I attended his first course.

Soon after I left Cambridge in 1895, Dr Haddon began to plan his Cambridge Anthropological Expedition to Torres Straits (New Guinea) and Sarawak (Borneo), and asked me if I would join it. He proposed that it should leave England in March, 1898, and I realized that by that time I could have just managed to obtain a medical degree at Cambridge and at the College of Physicians and Surgeons. My interests in anthropology and psychology, my keen desire for travel, and my ready acquisition of foreign languages bade me accept this invitation. Dr Rivers was also able to be a member of this expedition, and at my suggestion my contemporaries, William

McDougall, of St John's College, and C. G. Seligman, of London University, were invited (and agreed) to join it.

In Torres Straits I assisted Dr Haddon in investigating native rites and customs. But my main work lay in co-operation with Dr Rivers, and I devoted myself chiefly to a study of the hearing, smell, taste, reaction times, rhythm, and music of the peoples in Torres Straits and Borneo among whom I spent the following 12 months.

I returned from the Cambridge Anthropological Expedition in March 1899, just in time to take up the appointment of House Physician at St. Bartholomew's Hospital promised to me before I left England. A few weeks before the termination of this office, in March, 1900, a breakdown in health forced me to Egypt, where I wintered at the end of this year and also in the following year. During the latter half of 1900 I wrote a criticism of Ward's *Gifford Lectures on Naturalism and Agnosticism*, which was published in 1901 in the *Philosophical Review*. While in Egypt I studied hieroglyphics, stayed with excavators of antiquities, and journeyed on camel to the Great Oasis. In 1901 I prepared an M.D. thesis on *myasthenia gravis* and I carried out a study of native tattooing and an extensive piece of anthropometrical work in Cairo and Khartoum among the soldiers of the Egyptian and Sudanese Armies, which were later published in a series of papers in the *Journal of the Royal Anthropological Institute*, 1903-1908.

In the spring of 1902, thoroughly restored to health, I resumed residence in Cambridge, where I remained for the next 20 years, save for the period of the Great War. I was at first engaged in working out my Torres Straits, Sarawak, and Egyptian psychological and anthropometric data and in carrying out research on the upper limits of audible pitch.

By this time I had begun helping Dr Rivers in the conduct of his practical classes in experimental psychology at Cambridge. He had become University lecturer in experimental psychology and physiology after some years and was using as his laboratory three rooms in a dilapidated building in St. Tibbs Row. In 1903 the Psychological Laboratory was transferred to 16 Mill Lane, a cottage belonging to the University Press. In this year Dr Rivers secured from the University the munificent grant of £50 for the purchase of instruments and a promise of £50 annually for the maintenance expenses of his laboratory.

In 1904, the year of my marriage, I was appointed University Demonstrator in Experimental Psychology at Cambridge, shortly after I had begun part-time teaching work in the subject at King's College, London. Here a Professorship was created for me in 1906 and I carried out research with Professor H. A. Wilson, on the influence of binaural phase differences on the localization of sounds. Although our explanation of this influence (in terms of intensity differences) has not gained general acceptance, no other hypothesis has since been proposed which does not, to my mind, present equal or greater difficulties.

During this period I was also engaged in making observations on the colour sense of my eldest infant, and I was largely occupied in preparing my *Text-book of Experimental Psychology*, the first edition of which appeared

in 1909. The sole books on the subject in the English language hitherto available were the purely laboratory manuals of Titchener and Sanford. None of the existing textbooks on psychology devoted adequate space to describing the results which had been reached by experimental methods. About this time my attention had been directed to the importance of some knowledge of statistical methods; and so, for the first time in any scientific textbook, a chapter on this subject was included in my book. Through Dr Rivers' teaching I had become impressed also with the importance of a thorough training in the psychophysical methods, no other natural science possessing so refined and delicate a system of experimental procedure. I believe that the several 'schools' into which psychology is so unfortunately divided, and to none of which I have ever been able to give undivided allegiance, owe their existence largely to lack of training in these methods and to the undisciplined conduct of research, the rash generalizations, the prejudice, and the influence of suggestion thus engendered.

It was partly in order to insure adequate knowledge of the psychophysical methods that I began my textbook with a study of the sensations, although I made it clear in my introductory chapter that sensations must not be considered as the simple, original elements of experience but are to be regarded rather as the outcome of ultimate differentiation and analysis in psychology. I recall, by the way, with what pleasure in later years I received the intimation from one of the leaders of the Gestalt school (who had undertaken the translation of my book into German, which was interrupted by the Great War and finally abandoned) that he had been largely influenced in his extreme insistence on context, configuration, and structure by the just mentioned views which he had read in the first chapter of my textbook. In 1911 I published a briefer, more popular *Introduction to Experimental Psychology* with the object of informing the general public concerning the scope of psychological experiment.

I resigned my London work in 1909, when I was forced to take a six-months' rest, and was then appointed University Lecturer in Experimental Psychology at Cambridge, Dr Rivers now dividing with me his former joint lectureship in this subject and in the physiology of the senses.

In 1910 I was appointed by Cambridge University to a syndicate instructed to arrange for and to report on the provision of a suitable laboratory for experimental psychology, in place of the "damp, dark, and ill-ventilated cottage" (as it was publicly described) which then did duty for the purpose. The cottage was at that time hopelessly overcrowded. In 1912 the new laboratory was opened, which I had planned after holiday visits to American and German universities. My father had died just before this time and I devoted anonymously part of the money which he had left me to defraying most of the cost of the building in his memory. In the same year I was appointed Director of the Laboratory and in the following year was granted an Assistant paid by the University, in addition to a Demonstrator who was paid out of the fees received.

Meanwhile, I was endeavouring to improve the university status of the subject and to promote a wider interest in it. I was largely concerned in

establishing in 1912 the University Diploma in Psychological Medicine which was unique in requiring written and practical examinations both in psychology and in neurology—two most important adjuncts to the equipment of the thoroughly trained psychiatrist.

I was also responsible for getting an examination in psychology included at Cambridge in the choice of so-called special examinations in the curriculum for the Ordinary (pass) Degree for B.A. In this examination, established in 1911, animal and educational psychology could be offered as additional optional subjects. In 1914, a Tripos in Anthropology was established, which I likewise initiated. I was further closely concerned in the foundation of the *British Journal of Psychology* in 1904, which in 1914 became the organ of the British Psychological Society. It was edited at first by Professor James Ward and Dr Rivers, and from 1911 to 1913 by Dr Rivers and me, when I became the sole responsible editor, continuing to act in that capacity (save while on active service during the War) until 1924. Thus I started on a life of article-reading, manuscript-revision, and proof-correction, from which I have never since been free. My research at this time related mainly to primitive music, synaesthesia, the influence of timbre and loudness on auditory localization, individual differences in the attitudes of listeners to musical sounds, and visual contrast. The research rooms of my laboratory at Cambridge were in such demand that it was already becoming difficult to accommodate my research students and staff. Through it passed F. C. Bartlett (my successor at Cambridge), Cyril Burt, Eric Farmer, H. Hartridge, John Laird, E. O. Lewis, J. P. Lowson, C. A. Mace, B. Muscio, W. Sprott, Frank Smith, R. H. Thouless, C. W. Valentine, and others who have since obtained University or research appointments.

My wife and I spent our summer holidays during these years usually in mountain-climbing in Switzerland, thus qualifying me later for membership of the Alpine Club, and I amused myself with masonic activities and with organizing professional orchestral concerts in Cambridge. When the Great War came in August 1914, I tried vainly to continue the work in which I was then engaged, of studying the unique records of Australian music which the late Professor Baldwin Spencer had presented to the large collection of phonographic musical records which I had gathered together from all parts of the uncivilized world. I was then 41 years of age and, on applying to the British War Office for service in France, I was informed that no medically qualified volunteer who was over 40 years old could be accepted. A few weeks after the outbreak of war, I resolved to journey to Paris *in mufti* and succeeded in persuading the Commandant of the Duchess of Westminster's Hospital, which was about to open at Le Touquet, to appoint me as Hospital Registrar. Early in 1915 I was given a commission in the Royal Army Medical Corps in France, and received the welcome news of my election into the Royal Society of London. In March of that year I was instructed to proceed to Boulogne and to supervise the treatment of functional nervous and mental disorders occurring in the British Expeditionary Force. In 1916 I moved to General Headquarters at St. Omer, where I was appointed Consultant Psychologist to the British Armies in France and had to

visit the special wards for 'shell shock' and mental cases, both in the many base hospitals and in the casualty clearing stations nearer the front, which had by this time been established.

I must have been, I suppose, the first to recognize, in the British cases of 'shell shock' in France, the essentially psychological nature of this condition and to apply psychotherapeutic measures, chiefly by obtaining persuasively the recall of repressed memories, with or without the aid of light hypnosis. The first successful results of such treatment were published by me in the *Lancet* during 1915 and 1916.

Throughout my work in France I had to meet no little opposition from the Army Medical Service and the Adjutant General there. Indeed I doubt if even at the end of the War their original attitude was wholly changed that the 'shell-shocked' soldier was necessarily a coward and that a deserter must be either a certifiable lunatic or a criminal deserving only of being shot. Hardly any of the administrative army medical staff recognized the value of the therapeutic work so devotedly and assiduously carried out morning, afternoon, and often evening by the excellent temporary medical officers who acted under my supervision.

By the end of 1917, at my own request, I was recalled to England, there to act during the rest of the War as assistant to Dr (Colonel) W. Aldren Turner through whom I had received my original appointment in France. My duties now consisted in inspecting military 'shell shock' hospitals throughout England and Scotland for the War Office, and in endeavouring to bring harmony among a body of dissatisfied home specialists. This last phase of my army service I began by residence at Dr Rows' successful hospital for 'shell shock' cases at Maghull, Lancashire. Here I reached the definite conclusion that I could never owe allegiance to any one of the various schools of psychoanalysis, or of psychotherapy, preferring to recognize the undoubted partial truths in each and to refuse acceptance of their wild and mutually antagonistic generalizations. Here, too, owing to the chance remarks of an old pupil whom I found there, Professor T. H. Pear, I first came into touch with industrial psychology. He drew my attention to a book on the subject recently written by a Cambridge pupil, subsequently my demonstrator, the late Professor B. Muscio.

During the last year of the War I spent most of my leisure time devising tests, and supervising their application, for the better selection of men suited to hydrophone work, in which they had to listen in order to locate enemy submarines.

On demobilization I returned to Cambridge, fired with the desire to apply psychology to medicine, industry, and education and becoming increasingly disgusted, after my very practical experience during the War, with the old academic atmosphere of conservatism and opposition to psychology. I found that the wild rise of psychoanalysis had estranged the Regius Professor of Physic; I received little encouragement from the Professor of Physiology; and the Professor of Mental Philosophy, to my surprise, publicly opposed the suggested exclusion of the word 'experimental' in the title, now about to be conferred on me by the University, of Reader in

Experimental Psychology. Thus medicine, physiology, and philosophy had little use then at Cambridge for the experimental psychologist. About this time I lost two of my ablest research workers there owing to their outstanding merits not being recognized by a Government Research Body on whose grants they were dependent for their work. On the other hand, a school for high-grade mental defectives had been established near Cambridge, and here an able research student, Miss L. G. Fildes, came to work under my supervision. Thus I was brought into close touch with various Bodies concerned with mental deficiency and mental hygiene.

In 1918 I gave two lectures to the Royal Institution which were subsequently published in a booklet under the title of *Present-Day Applications of Psychology*. This led to my contact with Mr H. J. Welch and to our joint successful efforts to found in London the National Institute of Industrial Psychology. Towards the end of 1918 I obtained a year's leave of absence from Cambridge mainly in order to reflect on my situation, during which I wrote my first book on industrial psychology, entitled *Mind and Work*. In 1921, when this book appeared, the new Institute became finally incorporated, with Mr H. J. Welch as Chairman and myself as Director (later Principal); and by the following year I had realized the physical impossibility of developing simultaneously the Institute's work in London and that of the Psychological Laboratory at Cambridge.

It was no easy measure to decide which work to abandon. I had spent most of my life from 1891 to 1922 at Cambridge. I had secured what would have been practically a life-long University appointment and a College Fellowship. My wife was devoted to Cambridge and hated the conditions of London life. But she left the decision entirely to me, and, influenced, I suppose, by the applied psychological work which I had been doing during the War, I resolved to desert academic life and, as my less friendly critics have said, to plunge into the business world—in imitation, if they but knew it, of my forbears. But, deeply as I loved Cambridge, I have never had cause to regret my decision.

From 1922 onwards, therefore, I have given most of my available time to the development of the National Institute of Industrial Psychology. In 1932, jointly with Mr Welch, I published a history of the first decade (1921–1930) of my Institute's work under the title of *Ten Years of Industrial Psychology*, from which I quote the following passages.

On its incorporation the Institute started with two rooms. Its premises in Holborn were three times extended during its eight years' occupation of them—until 1928, by which time congestion and consequent interference with effective work had become so serious that it was forced to move to ampler offices, which it found in Aldwych House, Aldwych, W.C.2. . . . The latter comprise twenty-six rooms, and include well-equipped laboratories, library, lecture room, research rooms, and include vocational guidance, clerical offices, staff room, etc. In 1920 the staff consisted only of the present Principal and Director—Dr Myers and Dr Miles. By 1930 it numbered about fifty persons, including some thirty-five investigators, research workers, departmental heads and their assistants—practically all of them university graduates.

The general scope of the Institute's work was planned on lines similar to those of a hospital medical school; the Institute would engage in practical work, research, and teaching, none of which could be effectively carried out singly by an

organized body, apart from the two others. The practical work was to consist in undertaking investigations into the improvement of the human factor in factories, etc., in introducing better methods of selecting the workers best fitted for vacant positions, and in advising young people as to the careers for which they were most suited. The research work was to include the study of the human conditions necessary to give optimal output, the conditions of mental and muscular fatigue and boredom, and the devising of tests and other methods for better vocational selection and guidance. The teaching was to include the establishment of a library, propaganda work among employers and employed, training courses, and university and other lectures.

A considerable body of research work carried out under my supervision has been published—on tests of mechanical ability, the measurement of manual dexterities, performance tests as a measure of general intelligence, problems of attention and of preservation, vocational guidance, etc. Courses of University and public lectures have been given and published on muscular work, incentives, accidents, rationalization, etc.

From 1918 onwards, for more than ten years, I was also closely connected with the early work of the Industrial Fatigue (later called Industrial Health) Research Board, being a member of this Government Body, serving on several of its Committees, and giving much time to its initial organization and to the supervision of its investigators' reports.

In 1919 I was mainly instrumental in changing the constitution of the British Psychological Society, which had been founded in 1901 and of which I had been the Secretary from 1906 to 1910. Henceforth it was divided into sections comprising the general, medical, educational, industrial, and aesthetic sections, each with its own officers. The first three of these publishing separate journals. In 1920 I was elected the first President of the newly constituted Society.

In 1922, at a few weeks' notice, I was asked to preside over the Psychology Section of the British Association, owing to the sudden death of Dr Rivers who had been previously appointed to this office. I chose as my subject the contributions made by my old teacher to the advancement of psychology. Few could realize, so fully as I, all that he had done to promote the scientific status and recognition of the subject in Great Britain. To him I owe the great importance which I attach to a strict training of the experimental psychologist in the psychophysical methods. To him I owe, too, the great interest I have always taken in the study of individual mental differences and the balance which I have striven to hold between the value of the results obtained from each individual and the value of the blurred, often meaningless, though statistically reliable, data obtained from large masses of individuals.

In 1922–1923, I was engaged in organizing the first International Congress in Psychology, held at Oxford, after the War. I was elected President of the Congress, and a difficult and delicate task it was to bring members of nations so recently hostile to one another to an amicable scientific meeting.

In 1924, I was invited to give a course of lectures on Industrial Psychology at Columbia University, New York. These were published in the following year under the title, *Industrial Psychology in Great Britain*. In

1929, I gave six lectures on the human factor in business organization as Muirhead Lecturer in Social Psychology at Birmingham University. In the same year I gave the Herbert Spencer Lecture at Oxford on "Psychological Conceptions in Other Sciences".

In 1932 I gave a course of three lectures in London on the dangers and advantages of *Business Rationalization*, considered from the social and psychological standpoints, and I delivered the second Hobhouse Memorial Lecture on the *Absurdity of Any Mind-Body Relation*. In the latter I tried to establish the view that the differences between mind and matter are not those commonly supposed to distinguish spirit from substance, but that the essence both of mind and matter consists in activity—dead matter in blindly mechanical activity, living matter in "a unique combination of certain unique mechanical activities with non-mechanical directive activities". Mental activity and living bodily activity are identical: conscious activity is distinct from cerebral activity because "the former is only known to us individually and personally, whereas the behaviour (i.e. the activity) of the latter consists of public properties amenable to scientific treatment and partly common to the properties of non-living matter".

A more detailed presentation of these views would be out of place in this autobiography. But the foregoing sentences may serve to indicate the views which I have come to hold on the nature of mind. Their development has been by no means easy in a life largely spent in organizing and administrative work. My interests and talents in the latter direction are related probably to my ancestors' business careers. Many of my scientific colleagues in this country considered that I had taken a retrograde step by 'going into business', when I gave up a secure academic position at Cambridge for the development of an institute in industrial psychology. It was a hard task to combine the reticence of a man of science with the necessity for a certain publicity in order to develop popular interest in the subject of my later work. My Institute was wholly unendowed. Funds had to be collected for research and for educational work. My tendency to supervise younger people's research work rather than to engage in it myself arose doubtless from my wide interests in various subjects and in my fellow men, my love of novelty, and my consequent difficulties in concentrating attention on any one small sphere of work. But, in thus following my early inclinations and natural bent, I have probably served psychology better than I could have done in other, more usual, ways.

REMEMBERING DR MYERS*

F. C. BARTLETT

I DO NOT PROPOSE to tell the story of the leading and varied events which, in their sequence, made up the external life of Dr Myers. This has been done already, by himself and others, in ways and places readily accessible to any reader (see, for example, Myers, 1936; Edgell, 1947; Pear, 1947; Bartlett, 1948; Raphael, 1964). I shall attempt the more difficult task of building a picture of the man, his many interests, his intellectual and practical achievements, his influence during his life and since. Whether I can succeed is another question; but it seemed to me that this is what I must try to do, if only because, in my own psychological life, I owe more to Myers than to any other man.

My first meeting with Dr Myers was not face to face. It was in what I think I may fairly call the psychological 'realms of gold'. Red gold it was for me, the old, red-bound edition of his *Text Book of Experimental Psychology* (Myers, 1909) and the year was that of its initial appearance. I can remember well the growing excitement with which I read and reread its pages, admired the unornamental but lucid, graphic and economical style of its writing and the sincerity and authority which the book carried with it. At this time Myers was 36 years old and many, perhaps most, of the interests which lay behind the extremely varied achievements of his life were already well developed.

Let me say at once, for it is important to bear this closely in mind, that the bulk of these interests were derived directly from *people*. There was music. This and his sociability, his delight in meeting all sorts and conditions of men and women, came, he said, from his mother.

Then there was medicine. At school a well-loved master had swayed him towards classics and history; and indeed he retained strong literary interests, and even ambitions, all his life. But it was medicine that caught and held him, and again the moving influence was personal. "I had," he wrote, "a handsome first cousin whom I worshipped as a hero. He took a medical degree and I wanted to imitate him." Myers always had his heroes and he never minded saying so.

A biological friend, older than himself and much admired, used to invite him to his house on Sunday afternoons. This was before his Cambridge days. At these Sunday afternoon parties he was introduced to many well-known contemporary biologists and physical scientists, and these, he said,

*The first Myers Memorial Lecture was delivered by Professor Sir Frederic Bartlett in Cambridge on 8 November 1964 and published in *Bull. Brit. psychol. Soc.*, 1965, 18, 1-10. This shortened version is reprinted with permission.

greatly broadened and diversified his medical outlook. When he came to Cambridge there was first Sir Michael Foster, who captured his imagination by the wide range of his teaching and his practical skill in building up a brilliant research group at the Physiological Department of the University. He also came under the enthusiastic influence of Dr A. C. Haddon, who then taught human anatomy but was soon to become a Cambridge Reader in Ethnology and Anthropology, and of Dr W. H. R. Rivers who was directing a course in the special senses and experimental psychology in the physiological department at Cambridge. Myers attended the first course which Rivers gave, and these two became close friends, with Rivers, who was nine years the older, as the predominant influence.

Myers never seriously contemplated the practice of medicine but for a time thought of concentrating on physical and racial anthropology. His first published paper gave an account of some skulls discovered at Brandon, Suffolk (Myers, 1896). He joined the famous expedition to the Torres Straits, organized by Dr Haddon, and was responsible for experimental studies of the hearing, taste and smell of the natives and of their reaction times (Myers, 1903). This expedition, together with the strong encouragement of Dr Rivers, was the final push which brought Myers into psychology, in the official manner, for the rest of his life.

So the stage is set for *Remembering Dr Myers*. The first memories, however, are those of Professor Pear and my wife. I suppose Professor T. H. Pear was Myers's first star pupil. When Myers came to teach in London, Pear was a student of physics and chemistry at the University there. But it must have been clear enough to any observant person that his real interests were overwhelmingly with human behaviour. Pear has described, in a letter to me, how some person—unnamed—suggested to him that he might have a look at the developing subject of psychology. He took the chance, went to some lectures by Myers and was immediately captured and held.

As a lecturer Myers was rather variable. He was deliberate, often even hesitating, and normally relied upon carefully prepared but sparse notes. Pear found him absolutely first-rate and says that the hesitations, the occasional long gaps, fascinated him because they never seemed to him to be due to any lack of knowledge or information, or to careless and inadequate preparation, or even to any lack of words but only to an overriding desire to be accurate and, if he was being critical, to be fair to others. He was, indeed, then and always, a lecturer for those who preferred matter to fluency. He was at his best in the conversational manner and the small class. In front of a large audience he often appeared ill at ease and hesitant.

In 1909 two students turned up at Cambridge who wanted to take an advanced degree in psychology. They were my wife and C. W. Valentine, who later became Professor of Education in the University of Birmingham. Myers, full of vigour after six months' rest, agreed to conduct the first course of advanced lectures in psychology ever given in Cambridge. It extended, as it turned out, over two years. My wife had, for various reasons, expected to find a lecturer of advanced age. But here was a young man of thirty-six. He was maybe a bit above average height, slightly stooping but

lithe and active (he was a first-rate dancer and was fond of it), very friendly and approachable. He had a noticeably large head, fair hair and eyes grey with a suggestion of blue, the hair already thinning a bit. His face in repose was somewhat heavy, contemplative, but he had a most lovely and winning smile which, at this time, was frequent and altogether captivating. The lectures were naturally, in so small a class, conversational and therefore in his best style. He would, I am told, turn up loaded with references and with offprints of papers pretty well all in the elaborate German style of the experimental psychologists of that period and country. These his two students were exhorted, required, to consult and read. I am fortunate to have original notebooks of this course. The lectures were very comprehensive and detailed. They covered nearly everything that could be discussed in terms of experimental psychology at that time. The two predominant topics were the psychophysical methods (this perhaps because Dr Rivers was absolutely certain that they must be so treated) and current researches into the behaviour of simple organisms, of insects and of more developed mammals; this undoubtedly because Myers was himself intensely interested. The earlier conditioning work of Pavlov was considered in detail.

And now I can begin to draw upon my own memories. Remembering, as I have plenty of reason to know, can play strange tricks. I cannot recall when, how or in what precise circumstances I first met Dr Myers. Probably it was in a Practical Class in the new Laboratory, for he would often come into the 'practicals', then in charge of Sir Cyril Burt. He would come round from table to table, where we were doing experiments, perhaps ask a question or two, talk a bit, make suggestions. It was all informal. He came more as a friend than as a 'person in charge', genuinely interested in what we were doing and, so he made us think, in us.

Those were the days when senior members of the University could do a lot of entertaining. From time to time we, his pupils, were invited to lunch, tea, dinner at his beautiful home on the hill above Shelford village. He and Mrs Myers were the most wonderful hosts. We loved it. These four or five years while Europe was blundering on towards the first of the two great wars were, I think, Myers's happiest time in Cambridge, perhaps in his life. He was enormously busy, full of plans for the new psychological laboratory, he had some first-class students, his reputation was growing rapidly overseas, he foresaw a great future for psychology and he had a lovely home life.

Let it never be forgotten that the Cambridge Psychological Laboratory, opened in 1912, was—I think it is right to say *is*—his work. He planned it, to a very large extent in detail he designed it, he himself, his family and his friends, mostly paid for it. With some air of reluctance the University accepted it. They had great and now most fully recognized gain from its presence here, but in his lifetime the University never adequately repaid its debt to Dr Myers.

The year 1914 came, the war broke out. In the face of great official obstruction Myers went to France. He handed over to me the temporary charge of the department. But as anybody who remembers those years of the war will know there was comparatively little teaching to be done.

The classes continued but they were small. Before he left, with characteristic generosity, he gave me the lecture notes that he had carefully composed, all typed out on small leaves of blue paper. Without them I don't think I could have made any sort of a show of teaching and I relied on them heavily. Studying these notes, which systematically covered the whole range of psychology as it was then, I realized more fully and vividly than ever I had done before how accurate and detailed was his knowledge, how humane was his approach. In the next year it became clear to the War Office that nobody else could do the work that he could do as well as he could do it. Though he was forty-one and over the age for active service he was given a commission in the RAMC.

I think that Myers himself saw his life during the next five or six years as a continual and irritating struggle against prejudice and unintelligent opposition. From top to bottom the Army Medical Service of the time, with few exceptions, neither knew nor wanted to know how regard for and understanding of human behaviour could revolutionize the treatment of bodies and minds overcome by the stresses of war. With steadfast courage and unflagging effort Myers insisted on the psychological nature of what was then called 'shell shock' and practised his own psychotherapeutic methods of treatment. He won and in winning he saved the lives and honour of very many soldiers who, but for him, would have gone to the lunatic asylum or to the firing squad. He won, but at a price. He came back to Cambridge in 1922 but he was not the same. He was never to be the same again. The radiant smile was seen less frequently, he tired more readily. Much of his natural buoyancy and liveliness had gone. Perhaps most noticeable of all, his sensitivity to opposition and criticism had become far more marked. To me, to other workers and students in the laboratory, he was still wonderful, patient, always ready to counsel and to support. Some rewards came which he acknowledged and was grateful for, but they came late. He had been elected a Fellow of the Royal Society in 1915 and now he became a Fellow of Caius College; he was to be an Honorary Fellow later. The University made a Readership in Experimental Psychology and elected him, but even then there was a rather silly dispute about the title. Myers, who was always against the view that there are a lot of different kinds of psychology, did not welcome the word 'experimental'. He was outvoted and only those who were near to him and in his confidence at the time knew how much this grieved him. It seemed to him more and more as he afterwards wrote, that "medicine, physiology and philosophy had little use then at Cambridge for the experimental psychologist". About this time Professor Pear had drawn his attention to the possibilities of industrial psychology, which offered him a wider world, fresh interests and opportunities and a new chance to organize. He left Cambridge and, together with Mr H. J. Welch, he founded the National Institute of Industrial Psychology. He became its first Director.

Professor Pear has pointed out to me Myers's great and unselfish concern for the future of his own pupils. I want it to go on record what happened now. He had, as I have said, been made a Reader. But a Readership

in Cambridge at that time was very much a recognition of personal eminence. There was no guarantee that the office would outlast any particular holder. If Myers went the Readership might go. Rather against his own inclination he decided to stay on in Cambridge until it was practically certain that the Readership would not drop, and also that it would pass on to me, which was his wish.

From now on Myers's chief work and interests were in London and in the wide world of industry and of industrial research. His visits to Cambridge were intermittent. Whenever he came he would spend whatever time he could spare in the laboratory, advising, making new friends from among the fresh students and research workers, often looking for recruits for his own staff at the Institute. So far as I can remember he never interfered, but he was deeply interested in all the inevitable changes as the subject grew and as new fields of research opened up. Yet there remained a certain air of sadness. Often he seemed to tire more easily. He still saw himself as a pioneer, fighting against lack of understanding, wilful or unintelligent opposition and extreme conservatism.

I do not think that I can properly tell the more intimate story of these years that he devoted to the National Institute and its aims. Some of it has been told already but there must be much more to record. It seems a pity; but all the same it is a great tribute to Myers that the main fruit of his efforts and beliefs in both worlds, in the University and outside, has ripened only when he is no longer here to see. He died in 1946, seventy-three years of age.

And now if I am to do, even if briefly only, what I said I would try to do and attempt some estimate of his intellectual achievements and influence and maybe also of some of his idiosyncrasies, I must leave aside any discussion of many of the things that he did: his practically complete reorganization of the British Psychological Society and its journals, his building of the First International Congress of Psychology following the war, his lectures in America, his work for the development of psychology in the British Association.

In different ways Myers himself, various private secretaries that he had at that time, and contributors to the *British Journal of Psychology* while he was editor, were hunted by his meticulous regard for certain details of composition and spelling. As an editor he would go to enormous trouble and while, particularly in the early years, he was in general remarkably free and easy in all his social relations, as regards English composition he was apt to seem difficult, not to say pernickety. There was no appeal from the Editor.

Myers did not publish a very great amount in his own name. His direct influence was, however, behind much that others, especially younger people, wrote. Most of the work that appeared under his own name is still well worth studying with serious care. Two things about it are outstanding: the first is the enormous difference between the leading prepossessions of the psychologists of those days as he, with unquestionable correctness, represented them, and those which are current now; and the second, and more personal one, that he saw most of the leading problems

of psychology as forking off in two directions but very nearly always set himself to find middle paths.

It is interesting that his first published psychological papers were about linguistics (Myers, 1904) for as we all know, in the last few years there has been a very lively revival of interest among psychologists in linguistic problems. His problems, however, were not those of current linguistic research and I suppose that at that time they could not have been. What he was interested in was directly the taste, smell and colour names used by primitive people and by young children. He opposed the view, then often put forward, that where there were no names there was no experience; that, for example, because many primitive vocabularies contained no name for 'blue' the people who made and used them could not see blue (Myers, 1908). Names, he said, are given only to experiences which have some outstanding character, usually emotional or marking the operation of original, or very early developed, preferential tendencies. It seems to me likely that only those psychologists who lived through that period can realize with what pertinacity emotion and instinct thrust into the explanation of behaviour of the most diverse kinds.

Psychology was then, in fact, on the border of establishing close working relations with the older developed sciences, and to this movement Myers, with the variety of his interests, the wide range of his knowledge and a strong practical bent, contributed a great amount. Nobody, I think, who tries to look at the situation as it was then and to compare it with today can doubt that the other, and perhaps especially the more physical natural sciences, have had a far greater effect upon psychology than psychology has had upon them. So the general psychological outlook of the 1920s, when Myers was doing his main work and writing the papers which I am now considering, appears almost entirely foreign to that of today. We are preoccupied with problems of cognition, perception, intelligence and to a considerable extent with their apparent direct relation to action, and it may be that when we turn back to these writings of Myers and many of his contemporaries, and encounter numerous appeals to emotion and to forms of apparently underived activity, we may seem to be moving into a different world altogether. A good deal of what happened in Myers's time was no doubt due to the overwhelming influence of Freud, at whose feet we were all called upon to worship. Many times Myers himself protested against extreme forms of Freudianism as, indeed, he protested against all extreme forms of psychological doctrine, but nevertheless emotion and original tendencies were starting-points for him as for most of his contemporaries, not to be questioned and not in any exact psychological sense to be further explained or dissolved into anything else.

The second and, I think, from the point of view of trying to understand Myers, the more interesting characteristic of his intellectual outlook upon theoretical questions was his persistent endeavour to find middle paths. Perhaps this was the other side, the compensating side, of an equally strong bent in practical affairs to see clearly just precisely what he wanted and to go out for that without any compromise. Very early on he led a symposium

at a meeting of the British Psychological Society on Instinct and Intelligence. He said: "Instinct regarded from within becomes intelligence; intelligence regarded from without becomes instinct". And again: "Throughout the psychical world there is but one psychophysical function—instinct-intelligence" (Myers, 1910). Twenty-two years later he was invited to deliver the Hobhouse lecture at Oxford. He chose to speak about "The Absurdity of any Mind-Body Relation" (Myers, 1932).

Almost exactly midway between these two discussions Myers took part in a symposium on The Relations of Complex and Sentiment (Myers, 1922), a topic very much in the minds of British psychologists in those days. There was the same attempt to reach a conclusion set between two extreme views. "A complex," he wrote, "is not always morbid . . . a sentiment is not always healthy; . . . the sentiment may become a complex when the latter enters into the constitution of the former. There is sentiment as disposition, or organization, and there is 'sentiment-feeling'. They may appear to be two, but they are not radically so. The first is not experienced, but the second is. Except for this they are the same, only as disposition sentiment is something looked at, as feeling it is experienced from within."

From youth to age Myers did not readily change his views whether theoretical or practical. His predilections were, in theory, towards a kind of wholly uncompromising spirit of compromise between extremes; in practice towards activities equally unyielding, but without the admission of any sort of middle path.

Very early on he had been attracted by the contemporary Vitalist-Mechanist controversy (Myers, 1900). Characteristically he considered the opposition somewhat artificial and saw truth on both sides. He was asked, and agreed, to read a paper on this general subject at the Cambridge Moral Sciences Club. It was a club in which argument was apt to become rather bleak and, especially at that time, what is usually considered to be politeness in expression was not highly regarded. I was not there when Myers read his paper but I heard all about it immediately afterwards from somebody who was. This happened in G. E. Moore's most devastating period, when he would lose sight of everything except the point he wished to make himself and then proceed to demolish every argument he disliked with no reserve whatsoever. Moore was there. He heard Myers out and then sailed into the fight. He hated soft borders. If things were different, different they were. In dispute Moore was incredibly quick. Myers was slow and could, as I have said, appear hesitating. According to report Myers was utterly smashed into silence and submission. He seemed to have abandoned all attempts to essay the philosophic approach and he never published anything more in this mode. But in truth his basic interests and their direction did not change, nor did his basic methods alter. Very nearly every specifically psychological paper that he subsequently wrote revealed a strong interest in fundamental general problems, and he continued to see two opposed sides and to try to bring them together.

I have left out far more than I have said. Here was C. S. Myers. He built a laboratory, a society, an institute. More than that, I think much



more important than that, he built in those of us who knew him lasting love and respect. He was generous, gave us our chances and helped us to take them. He was not to be moved about by every wind of doctrine. On a foundation of extremely wide and varied interests he refused to be rushed to extremes in an extreme age, whether in psychology or elsewhere.

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C. S. MYERS IN RETROSPECT*

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Professor Rodger's retrospective view of C. S. Myers complements Sir Frederic Bartlett's. It reveals some problems that beset Myers's pioneer work and their adverse effects on the pre-war development of the Institute that he founded.

F. C. BARTLETT, giving the first of these memorial lectures in 1964, summed up the main achievements of Charles Samuel Myers in eight words. "He built a laboratory, a society, an institute."

The laboratory was the Cambridge Psychological Laboratory, of which Myers became, in 1912, the first director. He had planned it; and he had provided the money for it, mostly from his own pocket. The society was the British Psychological Society, of which he became, in 1921, half a century ago, the first president. The institute was the National Institute of Industrial Psychology, of which he became, also in 1921, the first director.

He did many other things. Some of them he recorded himself, in the Murchison *History of Psychology in Autobiography* in the mid-'thirties. F. C. Bartlett wrote informatively about him for the Royal Society when Myers died in 1946. Cyril Burt wrote an excellent obituary notice for Myers's own journal *Occupational Psychology*. T. H. Pear wrote a remarkable set of three, for the *British Journal of Psychology*, the *British Journal of Educational Psychology*, and the *American Journal of Psychology*. There is a great deal of relevant information in L. S. Hearnshaw's splendid book, *A Short History of British Psychology*. Before his death Myers himself compiled, with the help of his secretary, Miss G. Blunt, an autobibliography.

It is not my intention to go over ground covered thoroughly and perceptively by Myers, Bartlett, Burt, Pear and Hearnshaw. However, a short sketch of the background of this talented and exceptionally civilized man is perhaps desirable.

Born in 1873, he came from a well-to-do Jewish family with roots in London. His father, both his grandfathers and all four of his great-grandfathers were in business. His father was one of nine children. His mother was one of fifteen. On leaving the City of London School, with a very good record in both science and classics, he broke away from the family tradition—

*A modified and shortened version of the seventh C. S. Myers Memorial Lecture given by Professor Alec Rodger to the British Psychological Society on 17 February 1971. The lecture is published in full in the *Bulletin* of the Society for July 1971, and this version is published here by permission of the Society and the author.

though he was the eldest son—and went to Cambridge to study medicine. He gained a double first in the natural sciences tripos, in the subjects usually taken by medical students at Cambridge. In his spare time he played the violin and re-organized chamber music in the University. In all things his standards were high.

On qualifying in medicine Myers joined the Cambridge Anthropological Expedition to the Torres Straits. . . . He had been drawn in an anthropological direction by A. C. Haddon, a famous Cambridge zoologist who took a very broad view of his subject. Soon he was to become drawn in a psychological direction by W. H. R. Rivers, then a lecturer in the physiology of the special senses, to whom he formed a life-long attachment. Haddon's Torres Straits team was, Pear writes, "chiefly composed of young psychologists of varied temperament; Myers, Rivers, McDougall, Seligman." The label is interesting. The four 'young psychologists' had all graduated in medicine, and all were subsequently to become Fellows of the Royal Society; but none took, at any stage, an examination in psychology.

The titles of some of his early papers show how Myers's interests were beginning to blend: A study of Papuan hearing. The visual acuity of the natives of Sarawak. The taste names of primitive people. Traces of African melody in Jamaica. A study of rhythm in primitive music. What the titles themselves do not disclose is his growing devotion to psychophysical methods of enquiry, particularly the limiting method, the constant method, the method of mean error. Later, in the preface to his tiny book, *An Introduction to Experimental Psychology*, he was to say: "... the value of a close acquaintance with the psycho-physical methods is not confined to the field of 'pure' Experimental Psychology, . . . it extends to all investigations on the mind whenever observations are required under prescribed conditions which may be repeated later by the same or by different experimenters on the same or on different subjects, or which may be expressly modified later on by the same or by different experimenters." Myers was nearly always a very precise writer, but such precision, in an introduction to a kind of mini-Penguin, is so exceptional as to suggest burning missionary zeal.

Indeed, for Myers, convinced of the paramount importance of psychophysical methods of enquiry, experimental psychology became not so much a science, more a way of life.

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Pear would be far better able than I to judge what was happening to him during the formative few years after the Torres Straits Expedition, when Myers and Rivers were struggling to get experimental psychology on its feet at Cambridge. It seems to me, however, that with the additional work Myers took on as part-time professor of psychology at King's College, London, and commuting from Cambridge, his capacity, inclination and opportunity to be self-critical must have been severely restricted.

Then came the first war. He was 41 when it started, and 40 was the upper age limit for entry into the army. He went as a civilian to France, manoeuvred his way into a military hospital and in due course was made a lieutenant-colonel in the medical corps with the title 'Consulting Psycho-

logist to the British Armies in France'. Myers himself and others have told of his battles to secure acknowledgement of the basically psychological nature of what was then called 'shell-shock'; and of his attempts to persuade his Army superiors that the appearance of paralysis, deafness, blindness and other disabilities among soldiers was not something that called for the use of firing-squads. It was for him a period of frustration and misery.

During the last year of the war Myers became, for a brief space, an Admiralty psychologist. He worked at problems of submarine detection in a naval establishment perched improbably on the top of a hill in South London, HMS *Crystal Palace*. Before the war he had published his first contribution to the *Proceedings of the Royal Society*. It was called "The influence of timbre and loudness on the localization of sound", and its publication had been followed, a year or so later, by his election to Fellowship. We can imagine the pleasure with which he paced the quarterdeck of his rather peculiar ship, free once more to think about problems of the sort he really enjoyed. Long before, at King's College, London, he had worked on the influence of binaural phase-differences on the localization of sound. Here he was, back on his old scientific stamping ground.

In some ways it turned out to be a pity that he did not stay there. Though he continued to be, in part, the scientific researcher, in that teeming triangle bounded by physiology, psychology and anthropology, Myers's spell of duty in HMS *Crystal Palace* marked the virtual end of his already notable career as a pioneering scientist. True, he was still to become president of the International Congress of Psychology held in Oxford some years later. He was still to write reports more likely to be produced by a researcher than by anyone else (for example, on fatigue). But his life was changing rapidly: his inclination to organize was assuming control.

He returned to Cambridge after the war to find that even former supporters had apparently joined the opposition, partly through internal squabbles and partly because of what Myers himself described as "the wild rise of psychoanalysis". The sad story has been told by himself, by Bartlett, by Burt and by Pear. His departure from Cambridge to found, with H. J. Welch, the National Institute of Industrial Psychology appears to have had in it a touch of despair. There were perhaps elements of both apprehension and defiance in the manifold nature of his explorations at this time. I do not see any other explanation of the course of events.

Myers, back in Cambridge, had once more found himself frustrated. His plans for the future of psychology had met with apathy, even hostility. Inevitably, he had begun to think about other things to do, for he was still under fifty. So he gave, at the Royal Institution in London, two lectures on *Present Day Applications of Psychology*. In them he advocated the establishment of what he called 'institutes of applied psychology' in all main centres of population in Britain. But it was not until he met Welch, the prosperous business man, that he seemed to think very much about specifically industrial applications of psychology.

I say 'very much', because he had clearly given them some attention. Pear has remarked that Myers had been greatly influenced by his exhilarating

experience as an Admiralty psychologist in South London. It may be, however, that Pear is too modest in putting forward the idea that Myers's naval experience had led him towards industry. Myers hinted that Pear himself had been the decisive influence. It was he who, before all this, had told Myers of a book of lectures on industrial psychology published in Sydney in 1917. The lectures had been given by an Australian, Bernard Muscio. Muscio had already been in Cambridge, but not as one of Myers's students. He was hauled back and worked with Myers before returning again to Australia, where he died prematurely.

In the event, after two years or so of careful preparation, the National Institute of Industrial Psychology was incorporated, fifty years ago last Thursday, on 11 February, 1921. Myers did not take up his full-time appointment as director until 1922, partly because he wanted to make sure, before he left Cambridge for good, that Bartlett would succeed him.

The story of the Institute, from 1921 to 1930, has been told by Myers and Welch (mostly, in fact, by Myers) in their book *Ten Years of Industrial Psychology*. It presents an impressive record of growth. It shows, for example, that starting with two employees, Myers himself and G. H. Miles, by 1930 the Institute had a staff of fifty. Scientifically it is not a very exciting book; but, like its companion volume, *Industrial Psychology in Practice*, by Welch and Miles, it can be read with profit, especially by those who are readily tempted to think that they themselves have discovered some new problem in the occupational field. Those who are familiar with the Birkbeck 'fitting the man to the job' and 'fitting the job to the man' framework will see from those two books that all the main operational areas it covers—guidance, selection, training, methods design, equipment design, the design and negotiation of working conditions and rewards—all these had been promptly gathered in. Half the pages in Myers's *Mind and Work*, published in 1920, are taken up by material on restriction of output, industrial unrest, and payment systems. In his chapter on industrial unrest he remarked, in passing: "There are two fundamental conditions demanded by the workers which must be satisfied at the outset, viz. security against unmerited unemployment and a share in management." In 1925, in the first chapter of his *Industrial Psychology in Great Britain*, he reported that "sometimes the mere presence of the Institute's investigators and the interest which they have shown in the employees' work have served to send up output before any actual changes have been introduced". That was two years before the planning stage of the Hawthorne studies.

Comparison of the papers published in the very first volume of the Institute's journal and the list of contents of any current standard textbook of industrial psychology—Tiffin and McCormick, Blum and Naylor, Maier, Harrell, Siegel, Clay Smith, or any other—shows that Myers was ahead of his time in his conception of the practical problems to be tackled. In one matter he was, indeed, well ahead of it. Influenced, maybe, by the special interests of his co-founder, Welch, he arranged that occupational guidance should be brought within the Institute's terms of reference. We in Britain have derived—and will continue to derive—benefit from the decision they

made. I believe it was a very sound one. (I say "and will continue to derive", because the more closely an economy is geared to a policy of full employment, the greater becomes its need for links between guidance and selection, and for the fostering of research on allocation, career development, job rotation, job enlargement, job enrichment, occupational structuring and the like.)

There was, however, a 'bittiness' about Myers's wide sweep which, I venture to think, generated problems. . . . He had deeply-rooted personal characteristics which militated against his complete success in the role he had assumed. We can admire the breadth and depth of his interests, not only within the field of industrial psychology but outside it, without closing our eyes to an important fact. Myers was an eclectic, and he disliked comprehensive theorizing and 'schools of thought'. In this he was poles apart from, for example, his fellow-researcher in the Torres Straits Expedition, McDougall; and it may be that this was why, even at that early stage, they did not hit it off, despite the fact that McDougall had been invited at Myers's suggestion. Whether it was Freud on the one hand or Spearman on the other, his view was that people with 'theories' went too far. His reluctance to draw firm conclusions and make pronouncements was great, and it issued in a hesitancy which could be dispiriting. A long pause in a serious conversation could be brought to an end by one of his thoughtful, cautious, well-phrased constructive comments. Equally, it could be terminated by a grunt which, no matter how charming the smile that came with it, might seem to the recipient to take him nowhere. Myers was never a psychologist with a professional 'packaged deal'; and, even if he had had one, he would probably not have been good at selling it.

He did not even have a very noticeable taste for the systematic formulation of problems arising in the occupational field. His lists of topics for study were sometimes curiously loose and untidy. Symptoms, disorders, diagnostic instruments, treatments—all these tended to be jumbled. Though he sometimes spoke of wanting his Institute to become a kind of National Physical Laboratory, and though he frequently likened it to a teaching hospital, it was not easy to discern any pattern in his research and teaching programmes. I believe that this created an important obstacle in the way of the Institute's progress in the 'thirties. So did a related characteristic mentioned by Burt in his obituary notice of Myers. "It seemed to be his habit to dwell first of all on the weakness or the risks of any scientific development to which he felt himself drawn."

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Perhaps what I have called the 'bittiness' of Myers's approach would have been less important in practice but for some formidable problems that faced him, particularly after the Institute's first decade. . . . The industrial depression of the 'thirties had produced unexpected difficulties. The Institute, though 'a scientific association not for profit', was nevertheless dependent for most of its income on fees earned, and fee income was dropping. One rather important factor here was the growth of management consultancy and the appearance of competitors.

Occasionally it had had, in the early years, research grants from the Rockefeller, Carnegie and other trusts; and there was a small but useful flow of subscriptions and donations. But these had always been hard to win, and in the 'thirties they became harder. On Myers himself fell the main burden of money-raising, and it was one that he found both difficult and distasteful.

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The fact that Myers was having to spend his time in the 'thirties as a reluctant and unhappy fund-raiser was only one of his worries. A second problem lay in the deterioration of relations between the Institute on the one hand and the Medical Research Council (and its Industrial Health Research Board) on the other. . . . A third problem arose from what Myers regarded as the obstinacy of the business men on his executive committee. In spite of the fact that he himself had a business background, he disagreed with some of them frequently. He was not commercially-minded enough for them.

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One of the puzzling things about Myers was his apparent lack of contact with others working on similar or related problems. J. R. Rees, formerly Medical Director of the Tavistock Clinic, was one of them. Millais Culpin, of the Industrial Health Research Board, who was given the title of professor of medical industrial psychology in the University of London, was another. Spearman and James Drever, senior, were two more, though both had been at the early meetings of the Institute's scientific committee. Even Bartlett rarely appeared. Pear was an exception. He had been a student at King's College, London, when Myers was part-time professor of psychology there, and they were always 'close', linked primarily by a common interest in synesthesia.

Other exceptions were some eminent figures from overseas, among them people he had met when he was president of the International Congress of Psychology at Oxford in 1923. He was clearly a man of great reputation among them. Visiting, at his suggestion, Emilio Mira in Barcelona, Edouard Claparède in Geneva, Albert Michotte in Louvain, and Father Gemelli in Milan, I heard many tributes to his kindness and his scholarship.

The acceptance of Myers abroad was in some ways greater than his acceptance in Britain, though everywhere his prestige was considerable and a tremendous asset to his Institute. The fact that he was a medical man with a Cambridge Sc.D. degree and a Fellowship of the Royal Society was, of course, extremely useful to him in the fund-raising activities which occupied him excessively throughout the whole of his twenty-five years at the Institute.

I have suggested that it was in some ways a pity that Myers did not stick to the academic path. Let me finish this memorial lecture by giving two reasons for saying so. In the first place, it became clear that he was not well-suited to the job of raising money, or arguing about it. He did in fact raise large sums and win some of the arguments, but at great cost. Though he said that he did not regret having left Cambridge, I rather think he did. I had

been an undergraduate at his own college, Caius, and sometimes when we spoke of it his nostalgia was plain. Of course, if he had stayed there he would not have brought the Institute into being; but it is hardly conceivable that some organization of the kind would not have been formed somehow.

Secondly, and more positively, his record indicates that he was eminently suited to the academic life, not least through being an imaginative and scholarly worker at various frontiers of knowledge. He had no use for barriers. As he himself remarked, he loved novelty. He persuaded Cambridge to establish a diploma in psychological medicine, with compulsory papers and practicals in both neurology and psychology. Then he persuaded it to establish a tripos in anthropology. He did many other enterprising academic things. His range was enormous, as we can see from a glance through the two books of essays he managed to produce in the 'thirties, *A Psychologist's Point of View* and *In the Realm of Mind*, and from his autobibliography. It was entirely fitting that his last major task should be the preparation of the report of a working party, set up by the Society of Jews and Christians, on attitudes to minority groups. In his autobiography he had written about "a life of article-reading, manuscript-revision and proof-correcting"; but he enjoyed writing and editing, and he was superbly good at them, as his editorship of the *British Journal of Psychology* and *Occupational Psychology* showed. He was indeed a great man; but more, perhaps, a man of science than of business.

His choice on leaving school was possibly sounder than his choice on leaving Cambridge, but the latter was the more courageous. In the event, his Institute could have come to grief. It nearly did; but it escaped disaster. In my view it was saved by Clifford Frisby, who, starting as an industrial investigator, took over the secretaryship during one of the early periods of turbulence; and then, after bigger storms, became director. To Clifford Frisby and his staunch supporters—and particularly to that other old-timer, Winifred Raphael, who was there even before he was—we in the field of what Myers himself eventually called 'occupational psychology' owe much. To Richard Buzzard, now firmly in the saddle, we offer the hope that this fiftieth anniversary year will see new growth and new development, and even greater recognition for the Institute brought into being by Charles Samuel Myers.

EARLY DAYS IN INDUSTRIAL PSYCHOLOGY: AN AUTOBIOGRAPHICAL NOTE

ERIC FARMER

Mr Eric Farmer, one of the first investigators of the Industrial Fatigue (later Health) Research Board, and subsequently Reader in Industrial Psychology in the University of Cambridge, wrote this short note in 1958 in response to the Editor's suggestion that he should record some impressions of the nature and 'atmosphere' of the work in which he pioneered. It is reprinted from *Occup. Psychol.*, 32, 264-267.

DURING THE FIRST WORLD WAR there grew up an interest in the relation between human factors and industrial output. This was largely due to investigations carried out in the munitions factories when the pressure for higher output was so great. The Industrial Fatigue Research Board started a series of investigations of human effort in industry and my own first investigations dealt with time and movement study. At that time practically all that was known of the subject here was derived from the work of Taylor and Gilbreth. In all their experiments changes in methods of work had been associated with an increase in incentive by means of some form of differential bonus, so that the question whether certain changes in methods of work by themselves favourably affected output was not clearly answered. This was the first question that my investigations endeavoured to answer. The second question was whether some indication could be found as to the nature of those movements it was most easy for the worker to make in a repetitive task.

The main conclusion from these investigations was that constantly repeated repetition movements were easier to perform if they were based on a definite rhythm. The effect of rhythm was to postpone the onset of fatigue and enable the worker to work with greater ease. Various methods were adopted in order to get a simple rhythmic movement with a pleasant affective tone. Awkward or difficult movements were sometimes avoided by altering the layout of the bench or the size of working utensils, or by eliminating as far as possible movements involving undue choice or discrimination. In metal polishing the amount of effort put forth by the worker was measured by means of a wattmeter which recorded the pressure put on the revolving grinding wheel. It was found that when output was highest physical effort on the part of the worker was lowest, for she was working rhythmically and grinding less metal from the object. When fatigue increased physical effort also increased but output fell off.

In all the investigations we carried out no change was made in the method of payment and no special incentive was introduced. The only change

made was to lessen the effort required of the worker and so make the work easier. Where it was possible to make such changes there was a very significant increase in output and the new method was liked by the workers not only because they found it more pleasant, but also more profitable, since they could increase their output with no extra physical effort.

During this period I worked with Dr C. S. Myers to get under way the National Institute of Industrial Psychology. I was responsible for the first investigation the Institute undertook and several of the other early ones. These were all based on the principles of movement study. Coal mining, engineering and confectionery were some of the industries in which investigations were carried out. It was an interesting period, for we were constantly breaking new ground and each investigation involved some change in our methods of application. Basically, however, the principles remained the same—namely, to ease the effort required by the worker and not to endeavour to increase output by other incentives. It was always found that output increased when some of the hindrances to effectiveness had been removed by adjusting the work more closely to the natural capacity of the worker. The variations in capacity interested me greatly, and I started a series of investigations to see how far it was possible to measure psychological functions variations which were associated with variations in industrial performance. During all the investigations which followed I was closely associated with E. G. Chambers to whom I owe a great deal.

The underlying purpose of all our subsequent investigations was the measurement of psychological functions and their relation to some form of objective performance in skilled, semi-skilled or unskilled occupations. They were related to accident incidence in the occupational groups we were testing. During this series of investigations, the results of which have all been published in reports of the Medical Research Council's Industrial Health Research Board, more than five thousand subjects were individually tested. They were for the most part young entrants and their subsequent industrial careers and accident records were followed up. Performances in the tests were in no case used either for vocational selection or for vocational guidance, but merely to see if there was any relation between test performances and subsequent industrial performance. If any positive relation were found, it was felt that it would be an indication of at least some of the factors deserving of study by the vocational psychologist. It was the tests that were really being tested.

The tests used covered a wide range, including intelligence, sensori-motor capacity, special aptitudes and perception. I was indebted to Dr E. Schuster for devising and constructing many tests designed to measure various aspects of sensori-motor capacity. The use of a large number of tests in many different groups made possible the intercorrelation of all the tests with each other in many different groups. This provided a general picture of mental integration and the degree of association between test performance at different mental levels. It was shown that the more complex tests tended to correlate more closely with one another than the simple tests and also that this association was not due solely to the factor of intelligence they may have had in common.

The tests were also correlated with the number of accidents subsequently sustained by the subject. This formed an extremely difficult research to carry out satisfactorily on account of the number of factors affecting accident incidence which had to be controlled. Age, experience and exposure all affect accident incidence, and only in those groups where they were relatively constant could any reliance be placed on the relations between the tests and accident incidence. Nevertheless it was possible to show that sensorimotor capacity was positively associated with accident incidence although the degree of association was of a magnitude which showed that other factors than those measured by the tests also played an important part in accident causation. Our investigations showed that certain persons were more liable to sustain accidents than others, and that at least some of the factors involved in this susceptibility had been measured by the tests used. The term accident proneness* was therefore introduced to indicate a personal liability to accident differing from one person to another.

The results which emerged from the long series of investigations concerning the vocational value of the tests are too numerous to mention here. The general conclusion was that in all the occupations involved, except the unskilled, a positive relation between proficiency and test performance was found. Also, the more complex the occupation in relation to the capacity of those likely to undertake it, the closer was the association between certain psychological tests.

I hope this short account of some of my early work may be of interest to those who are working in the subject now. I had the great privilege of working in industrial psychology when we knew little about it and there were many who told us there was no such subject. To have seen it develop and to have played a small part in it has been a great pleasure throughout my working life for which I am very grateful.

*Later work has cast doubt on the validity of this idea, and many field research workers no longer use the term 'accident proneness'. *Ed.*

THE DEVELOPMENT OF INDUSTRIAL PSYCHOLOGY AT THE NIIP

C. B. FRISBY

Formerly Director, National Institute of Industrial Psychology

THE EFFECTIVE GROWTH of industrial psychology depends on the acceptance it can gain from those who are the subjects of its enquiries and those who provide the material resources it must have. The purpose of this article is to give a brief account of the research and advisory work of the National Institute of Industrial Psychology as it developed over fifty years and of the contribution to industrial psychology which was thus made. The work to be described has been carried out by the Institute's staff, often with advice and guidance of members of its Council and Technical Advisory Board. Hundreds of individuals have been involved, and to attempt to name them, even those whose contributions have been the most striking, would be too difficult if not indeed impossible. Publications have been selected to illustrate work mentioned in the text. Other activities of the Institute in the dissemination of information through lectures, courses and publications have done much to introduce to the minds of managers and workers the idea that a systematic study of the human problems of working life can help to contribute to their solution. Important as this side of the Institute's activities has been, it must be omitted from this article.

The Institute came into being as a result of the efforts of Charles S. Myers, the director of the Experimental Psychology Laboratory at Cambridge University, and Henry J. Welch, a business man particularly interested in the proper placement in employment of young people. In 1919 they began to seek support for the establishment of a body to apply psychological methods to industry and commerce; by the summer of 1920 they had obtained enough backing from a small number of industrialists to permit an office to be opened and work to begin, while the constitution of the organization, legally established on February 11, 1921, was drawn up. In this document the primary object of the Institute was stated as: *'To promote and encourage the practical application of the sciences of psychology and physiology to commerce and industry by any means that may be found practicable.'*

In 1913 Münsterberg, in *Psychology and Industrial Efficiency*,* had set out certain central purposes in business life which could be promoted by psychological techniques. They were—selection of the best possible men, the

*Münsterberg, H. (1913). *Psychology and Industrial Efficiency*. Boston: Houghton Mifflin.

establishment of the best possible psychological conditions for effective work and influencing minds through advertising and salesmanship. General or 'pure' psychology had not by 1920 established a substantial body of laws of human behaviour which could be directly applied to working life. But it had developed a methodology for its study based on the general scientific principle of controlled experiment, systematic observation and systematic recording. For the psychologist it was this technique of study which could be applied to industry and commerce; the physiologist had in addition a good deal of well-based, relevant material.

In its early years the Institute's resources were very modest; in 1922 its total income was less than £7,500 and of this over £4,500 was payment for services rendered. The growth of its activities was closely related to the extent to which industrial and commercial firms were willing to meet the cost of an investigation by Institute staff of conditions, from the human point of view, in their establishments. After a few years, funds for research were provided by the Carnegie and Rockefeller Trusts, but the Institute's research programme was in the main concerned with topics which were not studied on the shop floor. The reason for this situation was that the Industrial Fatigue Research Board of the Medical Research Council was primarily engaged in field research of this kind. It was agreed that general enquiries should be undertaken by the IFRB (whose name was later changed to Industrial Health Research Board) while the Institute would deal with the problems of particular organizations which cared to consult it. The arrangement lasted for some twenty years. It is convenient, therefore, to consider the Institute's research and advisory work separately, and in three periods—1921 to 1939, 1940 to 1945, 1946 to 1971.

1921 TO 1939 ADVISORY WORK

Investigations in Industry and Commerce

The Institute's investigators had no ready-prepared remedies to apply; they had in effect to make a diagnosis of the situation they found and to seek for improvements from the human point of view wherever they thought it possible to make them. As a result, in the early years particularly, their reports deal with a wide range of topics. A brief published account (Anon. 1922) of the first investigations begun in March 1921 in a tin-can factory illustrates this well, showing that

1. a more systematic grouping of the machines was suggested and devices introduced to avoid unnecessary stooping during gathering work and preparing material,
2. a determination was made of the most suitable weight of tool to be used,
3. experiments were made in regard to the effects of rest pauses,
4. an investigation of seating accommodation was carried out and an improved chair designed,
5. the ventilation of a soldering department was investigated and screens to protect workers from radiant heat were introduced,

6. the method of payment was found to be giving unsatisfactory results among workers, and proposals were made for a new scheme.

In June 1921 an investigation was begun in a firm of sweet manufacturers. After a general review it was decided to concentrate on the chocolate packing operations. A new bench was designed and methods of work replanned on simpler lines which reduced irritation and annoyance felt by many workers under the former system. Seating was also improved. In August 1921 studies in the packing department of another sweet factory showed that workers were handicapped by inadequate training. The methods were studied and a systematic course of instruction in them was drawn up.

It was not long before reports began to include proposals for improving the lighting of the work place and before the layout of plant and arrangements for movement of materials were studied. The use of tests in selection procedures, usually of an analogous nature, specially developed for the operation under review, was soon a common feature. It followed preliminary work of research to determine tests suitable for certain specific occupations.

It will be seen that in a very few years the Institute's experience had become wide. During the first ten or twelve years the Institute's investigations were basically concerned with the removal of handicaps, mainly material, which wasted the worker's energy, so that he could perform more effectively and with less fatigue. The measurement of fatigue by standard physiological procedures was not normally practicable in the industrial setting so that effectiveness as shown by work done—output—had to be used as the main criterion by which the industrial psychologist's efforts could be assessed.

From the point of view of the industrialist who was advancing the subject by paying a fee for an investigation output was a very important criterion, even when he recognized the hidden costs, such as labour turnover, which arise from a poor adjustment of people to their working life. Institute investigators were well aware of this and it no doubt played its part in the development in the staff of a strongly practical outlook in which obtaining useful results was of greater importance than evolving theories of human behaviour at work. It is understandable and in line with the primary object of the Institute, but it may have meant that opportunities for increasing basic knowledge were missed though methods and techniques of investigation were advanced.

In fairness, it must be remembered that basic shop floor research was being undertaken by the Industrial Health Research Board, and the Institute could reasonably regard its functions as the application of psychological methods to particular situations and general propaganda to advance recognition of its subject.

Work Study

Industrial psychologists studied people at their work place by movement and time study: they did not believe as some engineers affirmed, that there was 'one best way' of doing a job which had to be worked out and applied,

but they showed that it was possible to establish a good method of approach to a task which gave the individual some latitude to arrive at the best method for him. Proposals for modifying methods, tools, machines and equipment came from such studies. Later they provided the material for systematic training programmes designed to encourage the learner with a sense of progress and to help him with essential information to adopt a good method of work and to avoid errors. Office work was studied as well as factory operations, and the design of forms and clerical systems proved to offer great opportunities for reducing the mental load on clerical workers.

Gross movement study was also used to arrive at the most effective arrangement of machines, benches and equipment in terms of departmental layout. And the study of internal transport arrangements followed. Interest in these matters, which at first sight hardly appear to be ones for the psychologist, arose because detailed movement studies revealed the waste of time caused to operators by avoidable or inconvenient handling of materials between operations arising from poor layout or inadequate transport facilities. Similarly, it was the effect on the operator in delays, inconvenience and loss of earnings which made investigators begin to look at systems of programming and controlling production processes. It is difficult to realize now that the industrial psychologist should have felt obliged to undertake himself the development of effective systems. It must be remembered that in the 1920s management consultants equipped to deal with production planning and control were rare in this country, and a company's own staff usually had not the necessary time to give to the systematic studies required. Some of the Institute's investigators accepted the new challenge with enthusiasm and were able to persuade managements to allow them to tackle the problem.

It is perhaps more understandable that psychologists should be interested in the movement to establish central personnel departments, with whose work they were in contact when carrying out selection investigations. The Institute not infrequently helped to set up a personnel department and to frame the documents of personnel policy and practice which companies found it desirable to issue to employees to set out clearly rights and rules.

Consumer Psychology

It was some years before the Institute was asked for advice in the area which came to be called Consumer Psychology, which had been regarded by Münsterberg and many who came after him as part of the field of industrial psychology, but in the 'thirties quite a lot was done. This was mainly in obtaining users' views about the appearance, size, flavour, attractiveness of a number of alternative forms prepared prior to the launch of a new product or modification of an existing one. It was often necessary first of all to establish, sometimes by tedious observation, who were the actual buyers of the product, since the retailer came between the manufacturer and his final customer. It is perhaps worth noting that it was some of these investigations which involved the design of questionnaires and large amounts of data which introduced analysis by punched card machines into the Institute's practice.

The First Attitude Surveys

In the first twelve years the Institute's investigations³ were very largely concerned with the physiological and cognitive aspects of behaviour at work; they aimed at better results for a given expenditure of energy. The improvements they introduced were commonly received with satisfaction by the individuals whose work was made easier and this was accepted as a justification, beyond the increase in output, of the changes made. The bearing of payment systems, conditions of employment, supervision and such factors on the worker's feelings about the job was, of course, recognized. But a systematic attempt to discover on a considerable scale what workers felt and thought about the job did not begin until 1934. The method adopted was that of the confidential, anonymous interview with all staff in a small organization and a careful sample in larger ones. It was described by the member of staff most concerned in its development in articles in the Institute's journal (Raphael 1937, 1944).

These surveys of workers' attitudes and opinions threw much light on the importance attached by employees to issues which from the point of view of management seemed minor. They illustrated the misunderstandings existing among workers and managers about the values, aims and intentions of the other. They showed up failures in communication between different levels in the organization; not only those which could lead to 'labour unrest', but also those that led to loss of production through, e.g. faulty planning, lack of maintenance, ill-defined responsibilities. Aspects of company policy and practice which called for consideration became very clear in these surveys which formed a most valuable first stage in many investigations. Complaints and criticisms were by no means the only material forthcoming, however. In not a few cases expressions of approval and praise for the employing company were more numerous than complaints, and many suggestions for improving production efficiency were always advanced.

The method of the confidential interview seemed to offer substantial advantages over the use of questionnaires in these studies. It is true that it took longer, but because the information obtained was all volunteered by those taking part, since the investigator did not ask questions, it was much more useful for diagnostic purposes than the mere counting of answers to predetermined questions. It also permitted the psychologist to form impressions of the intensity of feeling which lay behind the comments, so that the analysis of the results could be qualitative as well as quantitative.

Inspection Studies in the 'Thirties

Towards the end of the period a number of studies were made of inspection processes. It was usually found that these operations were in fact carried out at well below the level of efficiency required to ensure the quality of a company's products which inspection was aimed to achieve. Factors in the physical environment, particularly lighting, were certainly important, but the psychological processes involved in the subjective judgement necessary in so many forms of inspection were of particular interest. Variations in standard between inspectors was common, and the decisions of individual inspectors

about items presented on a number of occasions were liable to considerable variation. The most successful approach to inspection problems, after the physical questions had received attention, was in improving training, and in making available to each inspector specimens of articles just good enough to pass and just bad enough to fail (Raphael 1942).

Operator Training

Operator training had received attention in many earlier investigations, but the problems involved were given special study in the last two years of this period. Perhaps the very detailed subdivision of work which was increasing in many factories appeared to some managers to result in jobs so simple that they could be picked up without formal instruction on an organized basis. The Institute's investigations showed that this was often an unsafe assumption and that waste of effort, delay, frustration for workers and supervisors alike could be reduced by systematic training of novices to the simplest job.

A procedure was adopted by which the psychologist studied the job in considerable detail. (He was usually able as a result to suggest some improvements in method of working.) He then wrote out a description of the standard basic method of approach—operation by operation, as the task should be carried out. He also listed and defined all the technical terms involved and often prepared a 'museum of faults' to show the novice what had to be avoided.

In this way he prepared the material which had to be taught; the next stage was its ordering in a training manual, with instructions to the trainer about how it was to be used. Finally he coached the trainer in how to teach, how to gain the interest of the novice, how to encourage him with knowledge of results (Ungerson 1940; Blain 1944).

Vocational Guidance

In 1922 the Institute began a service of advice on the choice of a career for young people whose parents were willing to meet the cost. The service has been continued throughout the Institute's history. Practical work showed the need for the development of tests and for systematic occupational analysis. Reference to these points will be made below in the section on Research.

For the Institute, vocational guidance was always a collaborative task, in which the psychologist added his contribution and interpretation to the information provided by the young person, his parents and his school teachers. It was soon clear that in the collection of information from others well-designed forms would save a great deal of time in interviews and also provide guidance on their conduct. Throughout this period, therefore, there was a steady refinement, in the light of experience, of the record forms used. The basic methods in a consultation did not change drastically throughout the period; one psychologist was responsible for giving the youngster a fairly standard group of tests* and for interviewing him and his parents if they came to the Institute with him. He then considered all the data available to him and wrote the report in which the information was summarized and the

*New tests were, of course, developed and introduced into the battery from time to time.

suggestions for suitable forms of training and careers were put forward (Macrae 1932).

Practical issues of time and cost played a part in shaping the Institute's vocational guidance procedure. To keep down the latter, the adviser saw from six to eight young people a week; he had three to four hours with each. The time available for testing was, therefore, comparatively modest and the battery small by comparison with those used by psychologists in other countries. To be included in the battery a test had to justify itself by giving information which could not be gained from the record forms and the interview. Experiments with interest tests, for example, showed that their yield for vocational guidance in the Institute's conditions did not warrant the abandonment of other tests, which would have been necessary to include them.

The aim of the Institute's advisers was to get the youngster and his parents to think about the career problem with as much information as possible. Their assessments provided material which often changed considerably the outlook of the young person and of his parents. Their facts about the form of training required for the possible careers, and the kind of work involved in them, filled what was commonly a most serious gap in the parents' minds. In those days there was not the large range of publications now available which provide this information. The Institute had to collect it by occupational analysis and by approaching professional bodies and individuals with special knowledge of certain kinds of work.

The fact that a fee had to be paid meant that the vast majority of those who sought the Institute's advice were from backgrounds in which the higher range of careers was looked to. In the investigations to be described under Research the general population was studied and occupational information for the area concerned had to be collected.

The Institute did its best to obtain information about the subsequent training and careers of those who sought its advice. The numbers available were far too small to permit any analysis of test results or assessments of temperamental qualities in terms of individual occupations. Its follow-up studies sought to determine how successful its predictions, based on the procedure as a whole, proved to be. If a correct prediction is taken to be a case in which an individual followed the advice and succeeded or rejected it and failed, the proportion of correct predictions, on the follow-up studies regularly made, was between 75 per cent and 80 per cent. The Institute's staff had no illusions about the difficulties presented by these studies, particularly in deciding what really constituted success in an occupation (Stott 1939).

1921 TO 1939 RESEARCH

An account of the research carried out by the Institute during 1921-34 was written by Dr C. S. Myers (1934), the Principal, and published as *NIIP Report 5*. It listed fifty-six items. Very few of these involved studies on the factory floor, this kind of research being left, as already stated, to the Industrial Fatigue (later Health) Research Board. The first researches were paid for from the Institute's general subscriptions, but in 1924 the Carnegie

United Kingdom Trust agreed to finance an experiment in vocational guidance, lasting several years, which covered 1,200 elementary school children in an urban area. In 1926 the Laura Spelman Rockefeller Memorial Fund offered £2,000 a year for five years for general research purposes. In later years other trusts and bodies gave support for particular projects.

Research in Vocational Guidance

Experiments in vocational guidance undertaken in co-operation with local education authorities were the major items in the research programme. Five of them were begun in the first twelve years, although one had to be abandoned before completion. The first was carried out with the co-operation of the Industrial Fatigue Research Board (Gaw *et al.* 1926). The second, on a larger scale, provided valuable guidance for later work (Earle *et al.* 1931). The third was carried out by the Birmingham Education Authority to which a member of the Institute staff was seconded. This was easily the largest, longest and most comprehensive experiment with which the Institute was associated (Allen and Smith 1932, 1940). In the fourth, both rural and urban children were included and some valuable work on test performances was possible (Earle and Kilgour 1935).

An enquiry on rather more restricted lines was carried out for the IHRB in a borstal institution. Four hundred boys were examined by a member of the Institute's staff, who drew up recommendations as to the form of borstal training most appropriate for each. The recommendations for 200 boys were passed to the authorities, the other group of 200 being used as a control (Rodger 1937).

Occupational analysis was studied from the earliest date: it was an essential part of the vocational guidance experiments and of the case work of the Institute (Earle *et al.* 1926). Particularly detailed studies were made of secretaries, of nurses and of women teachers.

Research on Tests

In 1922 a beginning was made with the preparation of tests for specific occupations, those selected being clerical work, engineering, shorthand-typing, dressmaking and tailoring. Work on tests of general and special aptitudes followed almost immediately and remained a regular preoccupation of the Institute. Some of these tests were restricted to the Institute's own use, but some were made available to qualified users for their own work.

Tests included those for general intelligence, in verbal and non-verbal form; for space perception; for practical ability; for manual ability—for mechanical aptitude; for colour discrimination; for distributed attention. The assessment of qualities of temperament and character came in for a good deal of study. The attempt to produce tests valuable in practical situations had little success, but much was learned about the use of the individual's history and interests as discussed in an interview. Much later, in 1937, the Leverhulme Trustees allocated a research studentship to the Institute and the holder made a special study of the conduct of the interview (Oldfield 1941).

Several years were given to the development and trial of tests for motor drivers, partly from the point of view of the selection of would-be drivers and partly to identify sources of weakness in a driver which might lead to accidents (Miles and Vincent 1934).

Research at the Work Place

Some research on working methods and environment was undertaken, though it was all on a small scale. The miner's lamp received attention in 1922 (Farmer *et al.* 1923). The influence of rhythm at work was examined in typewriting (Harding 1931b). The size of the unit of work was experimentally studied for two operations in 1931. The assembly of radio sets indicated the need for job enlargement (Harding 1931a) and the sorting of blackcurrants in a jam factory showed the depressing effect of too large a mound of work issued at one time (Harding and Manning 1929). Factory studies were made of the relation of menstruation to output (Sowton and Myers 1928). Agricultural work was reviewed to see what scope it offered for the economy of human effort and reduction of fatigue (Dunlop 1927). Working conditions in schools were also studied in a number of areas with the aid of grants from the Pilgrim Trust, the National Union of Teachers and the local education authorities concerned (Seymour 1939). Although lighting, heating and ventilation were the main issues considered, tests were also made of a yellow blackboard with blue chalk (Seymour 1938).

Towards the end of the period a different kind of study began. This was the examination of a matter by an extensive survey carried out by interviews and questionnaires. The extent and nature of labour turnover was looked into in London and Leeds. The information related to over 54,000 employees in London (Raphael *et al.* 1937a) and 10,000 in Leeds (Raphael *et al.* 1937b).

An enquiry into the operation of rest pauses and midshift refreshments covered 1,050 factories in seven industrial areas in Great Britain (Ramsay *et al.* 1939). A survey of leisure occupations and their use was undertaken on an intensive scale in Ipswich and less exhaustively in the Kesteven district and in Slough (Bevington *et al.* 1939).

1940 TO 1945

Advisory Work

Throughout the war the Institute was able to continue its vocational guidance and investigations, although on a very reduced scale because of work for the armed services which occupied all but a handful of its staff. The range of topics dealt with in its factory studies was reduced; with the great number of new workers pouring into factories, allocation to appropriate tasks, systematic training of the novices and surveys of attitudes to the job became particularly important.

Research

No new research could be begun during the war, but it was possible to carry on with certain work that was in progress when war came. One project

involved developing a new battery of spatial tests and using this to ascertain whether spatial judgement can be measured as effectively at ages 10–11 as at 14–15 (Slater 1943a). An attitude survey among hospital nurses could not be completed, but results were analysed and published (Bevington 1943).

The Armed Services

The experience of the Institute in assessing people in the light of job requirements, gained over many years in its investigations and vocational guidance, was recognized by the Royal Navy and the Army. The head of the vocational guidance department became Senior Psychologist to the Admiralty and the Institute seconded seven members of its staff to work with him on recruitment and allocation of men for the Royal Navy. Five members of the Army's Directorate of Selection of Personnel had been working for the Institute when war broke out. The Institute carried out a special study in an ATS unit for the Army as a separate project.

In the Royal Air Force, three members of the staff were occupied with different aspects of the training of air crew, including the preparation of synthetic training devices.

Whereas the Institute had been accustomed to dealing with people one by one, when arriving at its assessment of them, conditions in the Services demanded an approach on 'mass production' lines. A test battery which could be used satisfactorily on a group of people was needed; when interviews were given, the time available was very little, so that the technique of collecting or imparting information by interview had to be made as good as possible. The psychologists also took part in the group selection procedures developed for picking men for officer training.

Only a few of those who worked in the Services returned to the Institute after the war, but they brought with them much new experience which modified Institute practice in the future. Aspects of their wartime work are described in Frisby (1943, 1947), Jennings (1947), Mercer (1945), Misselbrook (1946), and Wilson (1945).

1946 TO 1971 ADVISORY WORK

Investigations in Industry and Commerce

The Institute's first task was to build up its staff to replace those who, after the war, remained in the Admiralty and War Office or joined the Selection Board established by the Civil Service Commissioners. Its advisory services, therefore, could only slowly increase. In industry and commerce investigations involving factory layout, routing and production control were not resumed. There were by then management consultants available to deal with these problems whose influence on staff and workers could be considerable but whose solution did not demand a psychologist's training. Engineers had been active in improving the physical environment—the lighting, heating and ventilation—and had been using movement study for some years in planning operation layout and method. In these fields, the Institute's advice was rarely sought after the war, and then only on specific problems—for example, the illumination and working methods in an inspection process. Investigations

tended to be shorter and to deal with one or more specific issues often by application of standard procedures and not to have the wide range of the early days. Selection and allocation, training, personnel policy and attitude surveys continued to be main topics. Work on consumer psychology was abandoned. A special battery of tests for engineering apprentices was prepared and a standard short procedure was adopted for introducing it. This was planned to train members of the company's staff to use the battery and to coach them in interviewing the candidates for apprenticeship. Groups of existing apprentices in their first year were tested and the results used as guides in determining standards of test performance appropriate to the needs of the company.

Two special studies financed by the General Nursing Council and the Ministry of Health respectively were made of entry tests and selection procedures for nurses. Judging the tests and methods demanded a criterion of nursing performance. The formal examination results, however these might be related to the nurses' work, were a positive criterion, though its reliability judged by experience with scholastic type examinations was probably not high. Assessments by sisters and others of ward work were subject to the well-known difficulties of such judgements.

The absolute measure was continuation in training to qualification or withdrawing from nursing—the pass/fail test. But it was not a very good test of a test's value, since the reasons for withdrawal could include such things as responsibilities to the family, marriage, shift work, reaction to patients in pain and other temperamental qualities. These studies added much to the Institute's experience, although the results could not be published.

A development stemming from Services work was the use of group selection procedures in advising companies on the suitability of candidates for promotion or new appointments. Follow-up studies were undertaken to assess the success of the methods (Fraser 1947).

Vocational Guidance

With the recruitment of additional staff, the vocational guidance service began to expand once more. The various record forms were considered regularly and modifications made in the light of experience. An edge punched case record card was designed to facilitate follow-up studies. An important change in the standard procedure was soon made; the presence of the youngster was required on two days. On the first he was given, with six or seven others, a battery of tests; on the second he was interviewed by the adviser in charge of his case and, as far as possible, by a second adviser.

This increase in the time available made it possible to use a larger number of tests and to try out new tests being considered for guidance work. Testing in small groups had its origin in the Service experience of some of the advisers.

The Education Authorities in Preston and Warrington, wishing to improve their vocational guidance service, invited the Institute to design a suitable course of training in occupational analysis, test administration and interviewing and to give the course to those of their teachers who were willing

to do careers work. Arrangements were made for subsequent courses from time to time, to keep up the supply of trained teachers (Reeves and Wilson 1949).

1946 TO 1971 RESEARCH

The Institute's general funds for research were exhausted by the small amount of work possible during the war. Some work on matters related to education was still possible financed from the Heath Clark Educational Bequest; the fund was used to begin a study of suitable methods for the selection of boys for building trade courses at technical colleges. Later this was broadened to cover boys on engineering and commercial courses. The groups comprised 400 boys in building courses, 400 on engineering courses and a smaller number on commercial courses. Test results were compared with the educational criterion of success in school examinations (unpublished).

In December 1947 the setting up of the Committee on Industrial Productivity was announced in the House of Commons. Early in 1948 the committee appointed a Panel on Human Factors to advise on directions in which productivity could be increased by the application of research into human factors in industry. As a result of recommendations made by the Panel various bodies, including the Institute, were invited to undertake research. The Institute's projects were concerned with the status, selection and training of foremen; joint consultation; the size of the unit of work. The first two were in the main careful surveys of a sample of industrial companies to obtain a good picture of British practice at that time, and it was hoped to identify factors associated with success in joint consultation. Some experimental work on selection and training of foremen was included. Interest in the size of the unit of work grew from the observations of Institute staff of the degree to which job breakdown had already gone in industry and of the likelihood of its going further. (It will be remembered that reference has been made to some preliminary work on this subject carried out in the 1930s.)

The decision of the Committee on Industrial Productivity made available to the Institute government funds which permitted it to undertake field research on a scale not possible before. Since the recruitment of suitably qualified staff was still very difficult, the competing claims for manpower of advisory services and research projects had to be faced. The Institute decided that research must have priority even though this entailed reducing advisory work so that investigators could transfer to research. This in effect recognized the feeling which had been growing among the staff for a good many years that the Institute's real aim should be the development of industrial psychology*, rather than the application of psychological knowledge and methods to working life. An article in this journal by a former member of staff set out most effectively the reasons why industrial psychology was a branch of psychology and not merely a technology for psychological applications (Hearnshaw 1942).

*'Occupational Psychology' was the preferred term indicating that behaviour at work of all kinds was the object of study.

This view was finally adopted in the Institute's constitution in 1951, when its principal object was altered to read: *'To develop and encourage the science of industrial and occupational psychology.'*

The government grant for the three projects was initially for three years and was administered by the Medical Research Council. The joint consultation survey was completed in that time and the results published soon after (NIIP 1952). A book on the foreman inquiry also appeared (NIIP 1951).

The Medical Research Council provided funds for continued work on foreman problems, and for the unit of work studies on a broader basis, with special reference to the organization of repetitive tasks (Cox and Dyce-Sharp 1951; Cox 1953). In due course it financed two further projects. One dealt with operator training in an attempt to measure the influence of different aspects of the training situation (Blain 1956a, 1958b; Williams 1956, 1957). The second, which was called "Criteria of Adjustment to Work", attempted to study the relation between the movement of indices such as labour wastage, absenteeism, lateness, accidents and output (Crowther 1957).

Later, the distribution of government funds for research on human problems in industry was made the responsibility of two joint committees of the Medical Research Council and the Department of Scientific and Industrial Research. These committees continued to support the Institute's research, and other work on foremen, including studies of their place in the management hierarchy, was begun. Accounts of this work appeared in the Institute's Journal, in its reports, and in other publications (e.g. Blain, Castle, Garforth 1951; Castle 1952; Handyside 1953, 1954, 1956; Handyside and Duncan 1954; Livingstone 1953a, b; NIIP 1957a).

A pilot study was undertaken in Warrington, with finance from the King George's Jubilee Trust, to test the possibility of analysing factors involved in adjustment to work and life of young people. Warrington was chosen because of the Institute's connection with its vocational guidance procedure. The aim was to establish direct contact with 100 boys and girls and with their parents and employers. Unfortunately 24 per cent of the young people were not willing to collaborate in the inquiry and evidence suggested that these included a large proportion of the problem cases, the study of which was particularly important from the social point of view; the conclusion was that the large-scale survey contemplated could not be recommended.

Another pilot study was an attitude survey among patients in hospital, which gave interesting results, although finance for studies on a larger scale could not be obtained (Blain 1953)*.

The Institute's experience of conducting surveys of industrial practice on matters affecting employees was extended by work on Project 179 of the European Productivity Agency of the Organization for European Economic

*In the 1960s following her retirement, Mrs W. Raphael, the Assistant Director of the Institute who had been particularly concerned with attitude surveys in industry and commerce, undertook a number of studies in hospitals (Raphael, W. 1969. *Patients and Their Hospitals*. London: King Edward's Hospital Fund.)

Cooperation. This was a survey of the training within the factory of operatives other than apprentices to skilled trades. The Institute's staff paid visits of one to three days to over 200 establishments in the United Kingdom collecting information about training policy and practice and its report was published in book form (NIIP 1956). In addition to undertaking the field work in this country, the Institute was chosen as the International Co-ordinator by the organizations undertaking the surveys in six other European countries. It prepared the report on the whole project published by the Agency (NIIP 1957b).

ESTABLISHMENT AS A RESEARCH ASSOCIATION

Money from official sources administered by a number of committees had over nine years transformed the Institute's research possibilities. Nearly half its staff were engaged in research. But the situation had certain disadvantages; the research consisted of projects, some proposed by the Institute, some by the committees, each of which had to be submitted in some detail for approval by the appropriate committee. Each project had to be for a specific period. In other words the terms of reference were fairly rigidly defined; this could easily mean that a topic which appeared to be of considerable importance and interest, could not then be taken up if it fell outside the original programme of the research during which it was encountered. The Institute felt that its full capacity for advancing knowledge through research could be used only if it had at its disposal a general fund for research which could be employed for work it considered worth pursuing.

Therefore, in 1956 the Institute approached the Department of Scientific and Industrial Research with a request that it might be treated in a similar manner to an industrial research association. This meant that it would set up a research fund to which would be placed its members' subscriptions and any gifts received for research. The Department would make a grant for research related to the size of the voluntary contributions given by industry and commerce. Although the Department would want to approve its research programme in general, it would not seek to assess individual projects.

DSIR granted the Institute's request for a trial period of three years, and thereafter extended it, subject to review every five years. Thus a new era began, in which research was to be the Institute's primary activity, research of a kind not usually carried out by university departments but requiring close contact with the working situation in industry and commerce. Space does not allow even a summary account of the studies undertaken in the next fourteen years; no more than a few words to expand the title of a topic is possible.

Research of a kind the Institute had always done continued with follow-up studies to evaluate its vocational guidance procedures and its system for the selection of engineering apprentices (Stott 1956; Frisby *et al.* 1959). A special study of vocational guidance follow-up results has been supported by the Clement Wilson Foundation (Lancashire and Cohen 1971). New tests of manual skill were produced in a search for a measure of a

general factor entering into all manual work (Vincent 1955). Success was shown in the statistical analysis and attempts were made to evaluate a group of tests by obtaining the collaboration of certain companies in their use in engagement procedures. A number of tests of colour vision and hue discrimination were developed, but no success was achieved in producing something sufficiently simple for use in industry.

A group of reports on attitude surveys in different companies was analysed to see how far a common pattern of topics for complaint might emerge (Blain 1958a). A study was made of the attitudes and beliefs of employees in a company which had just been 'taken over' after a keen financial battle (Raphael and Zimmerman 1963). The relationship between individual satisfaction and efficiency at work was investigated, and that of the general level of satisfaction in a particular unit and its rating for efficiency (Handyside 1961).

A lengthy study was undertaken of management structure—the shape or anatomy of an organization. There were a number of theories aired on this question, but factual evidence on the bearing of structure on managers' feelings and behaviour was lacking; the Institute sought to do something to fill the gap (Blain 1964, 1967; Keohane 1968; Blain and Keohane 1969). This led to the production of a questionnaire which was later used in assessing managerial morale and attitudes in companies seeking the Institute's advice.

Much work was done in developing and trying out tests and selection procedures for different levels of work in the exploding field of statistical analysis and machine accounting. These levels ranged from card punchers to computer programmers and systems analysts (Johnston 1965; Radforth 1966; Toplis 1968; Crawley and Morris 1970).

A study (unpublished) was made of changes in attitudes and efficiency following the move of a company to an entirely new factory in which a good many changes were made to established ideas of layout and work allocation.

Staff preferences for different systems of hours of work and holiday arrangements were examined in a group of retail shops with branches throughout the country (Buzzard and Garrard 1967). The results of introducing audio-typing into a government office were studied at the request and expense of the trade union concerned (Warne 1966).

A long term, one might say continuing, study was begun of personnel record systems and measures of performance as used by personnel and production departments. Field research had shown the inadequacies and unreliability of data on personnel on which important decisions might have to be based (Buzzard 1954; Buzzard and Liddell 1963; Buzzard and Radforth 1964). The Ministry of Labour financed a special three-year study aimed at designing and evaluating training record systems (Rangeley and Nuttall 1971).

Similarly, steps were taken to record systematically material gathered by staff in their many visits to establishments of all kinds. In this way current problems could be kept constantly under review (Toplis 1970).

A special study of industrial accidents was supported by the Ministry of Labour and the Ministry of Technology (the successor to DSIR). This involved continuous observation in contrasting workshops, with the aim of

compiling detailed records of people, machines, work and its physical and social environments. Accidents, minor and major, to people and machines or material were studied. Patterns of events and circumstances associated with each accident could be compared, and it should be noted that these were constructed not from facts acquired after the accident, but from the data obtained in the continuous observation (Hale 1969; Powell *et al.* 1971). Another special inquiry into accidents in electrical circuit switching was supported by the Electricity Council.

The creation of a general research fund in 1956 had the effect of softening what had been a hard line between advisory services and research. Advisory investigations after the war had become less general in their nature, more specialized, and often had defined terms of reference. This had made it normally impossible to follow interesting lines opened during the studies unless the subject of general interest to the psychologist was also of interest to the manager who would have to pay the cost of the work beyond the original terms of reference. With the research fund available, the Institute could itself finance such extensions of investigations and use the good opportunities for field research which had been revealed. The development of a science could now proceed side by side with the application of a technology.

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References appear among the publications of NIIP and its staff which are listed chronologically on the following pages.

SOME PUBLICATIONS OF THE NIIP AND ITS STAFF

FROM ITS INCEPTION the Institute has published a journal known successively as *The Journal of the National Institute of Industrial Psychology* (1921–1931), *The Human Factor* (1932–1937) and *Occupational Psychology* (1938 to date). In the early years this carried mainly accounts of the pioneering work done by Institute staff. Later, as ideas advanced by the Institute gained wider currency, increasing numbers of contributions from practitioners, teachers and research workers in other organizations were published in the Institute's journals. Titles of these articles are excluded from the list below, but are included in the indexes published in *Jl NIIP* 1929, Volume 4, *Human Factor* 1937, Volume 11, and *Occupational Psychology* 1969, Volume 43, 3/4.

Some of the Institute's early research done in collaboration with the Industrial Fatigue (later Health) Research Board was published by that already well-established body, but has been listed here. Important research on vocational guidance by the Birmingham Education Committee, to which a member of the Institute's staff was seconded, has also been included; otherwise the list is confined in the main to accounts of work by NIIP staff published usually—but not always—during the tenure of their Institute appointments, and chosen to illustrate the Institute's range of activities and interests.

The list is not exhaustive; the editor accepts responsibility for any serious errors of omission; and for inclusion of items which, if they seem slight by today's standards, are thought to have had some importance when they first appeared.

The compilation was done by Christine Chin and Margaret Grainger and is gratefully acknowledged.

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NIIP AND ITS STAFF 1921 TO 1961

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ANY ORGANIZATION can have many different kinds of review written about it. There is the story of its activities, of how far and in what ways it has achieved its aims, and then there is the more subtle and conjectural account of its influence on its employees and through them on their subsequent work. This article about the staff of the NIIP is based only on impressions and is necessarily incomplete, for several hundreds of people have worked there. However, as one who was employed for thirty-nine years, from 1922 to 1961, I have agreed to attempt it.

REVIEW OF FOUR DECADES

Thinking of the Institute decade by decade, one can, perhaps, describe the 'initiating 'twenties', the 'developing 'thirties', the 'war-time 'forties' and the 'research 'fifties' and can then try to sum up its strengths and its limitations.

The Initiating 'Twenties

In the 'twenties the Institute had a family feeling about it—a family with two brilliant and kindly fathers, Charles Myers and Cyril Burt. There were many Institute parties, we knew each other's families and visited each other's homes. The Institute also had, as cousins, the Industrial Fatigue Research Board, with which it conducted joint research and organized joint conferences.

The Institute work was rather sharply divided into 'industrial work' and 'vocational guidance'. The first group of industrial investigators (including Arthur Stephenson, Alan Angles, Sheila Bevington, A. B. B. Eyre and later Alan Hudson Davies, Rex Knight, Jack Jennings and O'Neil Manning) was under the guidance of the wise but vague Assistant Director, George Miles. They had extraordinary success—one can say 'extraordinary' considering how few of them had had previous knowledge of industry or precedents to follow; but the combination of intelligence and theory worked in practice. The more enlightened firms were the ones prepared to risk having this unknown species of adviser, the industrial psychologist; and often they entertained a group of Institute members* afterwards to show what had been done.

The vocational guidance department, first under Cyril Burt, then under F. M. Earle, conducted large-scale experiments (one jointly with the

*Members of the Institute are corporate bodies or individuals who subscribe to its research funds according to a fixed scale.

IFRB) as well as interviewing private clients. Whether officially or not, a number of Burt's 'young delinquents' were interviewed—the proportion of social deviants among the cases must have been higher than in subsequent decades. The V.G. team was a strong one and towards the end of the decade included names still known as leading authorities—Angus Macrae, Mary Stott and a little later Alec Rodger.

The relationship between Executive Committee and staff was close: Seebohm Rowntree, H. J. Welch and others were known personally, even to junior members of the staff. There was an entertaining staff magazine, *Nip-Naps*, that published, among other articles, a series of spoof reports. Those were brave days with the Institute staff striking out in industry and in vocational guidance with little background knowledge either of industrial organization or of information about occupations but aware that the only way of developing in both areas was by trying and gaining experience.

The Developing 'Thirties

By the 'thirties the Institute had become more professional. It had moved from the first office of five little rooms in High Holborn to much larger offices in Aldwych House. It knew where it wanted to go and it was a time of great development—possibly the decade when it was richest in talent. There was a large demand for industrial investigations. At first few industrial consultants worked in similar fields and many firms turned to the Institute for help; some investigations lasted for years rather than months (I think nine years by A. B. B. Eyre was the record) and other firms had successive investigations so that the same investigator returned perhaps three or four times. A strong team of investigators including Clifford Frisby, Alan Stewart, the Seymour brothers, Leslie Hearnshaw, James Mitchell, Bernard Ungerson and many others were advised by George Miles, who had an almost uncanny gift of spotting what needed to be done. As always when a number of intelligent young psychologists are working together, there were strong divisions of opinion—was the Institute wrong to do so much practical work at the request of industrial and commercial firms and trade unions or should it undertake more research? Did market research come properly within its scope? It was later decided that market research did not, in spite of the success of Nigel Balchin in designing Black Magic chocolates (unaltered today), during which period the walls of the Institute's offices were lined with boxes of chocolates like the witch's cottage in the Hansel and Gretel fairy tale. Toward the end of the period when internal differences flared up, the Institute took its own medicine of an attitude survey; there were various resignations and appointments of senior staff until finally Clifford Frisby became director and steered the Institute for thirty years.

There were also great developments in the Institute's vocational guidance department stimulated particularly by Angus Macrae, J. G. W. Davies and G. E. T. Whiting and for a long time by Alec Rodger. This department was particularly successful in attracting such staff as N. A. B. Wilson, E. C. Daniels, P. B. Home and H. A. T. Child. As well as giving advice to the many youngsters who came to the Institute, the staff also visited

schools to help groups of leavers and planned vocational guidance for those leaving borstal. D. F. Vincent became the father of many of the Institute tests used in this work, and he was helped by Edwin Rabe.

The Wartime 'Forties

At the very beginning of the war there was a curious standstill in the demand for the Institute's work, almost like the paralysis of shock, and the few requests that came were for help that seemed little connected with national effort—the first short investigation requested was for a training course for undertakers' salesmen. Some of the staff immediately joined the fighting services and salaries of those who remained were reduced for a short period. Then there was a sudden change to immense demand for help both from the services and from industry. First the Admiralty asked the Institute to organize selection methods for the Navy; Alec Rodger with a large team of Institute staff and others devised methods that proved very successful and were the basis of much subsequent work in personnel selection. The very day afterwards the War Office requested similar help; and legend has it that Jack Davies was promoted overnight from Corporal to Lieutenant-Colonel to take charge of it. Edith Mercer and Joan Wynn Reeves devised selection methods for the ATS (Auxiliary Territorial Service: the women's army) and while remaining with the Institute I worked for a time, together with staff from the Tavistock Institute, on the development of the WOSBs (War Office Selection Boards). Clifford Frisby prepared a training manual in elementary flying for the Royal Air Force, D. F. Vincent devised synthetic flying training apparatus and Charles Oakley was Regional Controller of the Ministry of Aircraft Production in Scotland.

The demands from industry for help were so numerous in proportion to staff available that sometimes one person had to conduct or supervise investigations at three factories simultaneously. The pressure was great for equipment needed by the Forces—for example, at the time of Dunkirk it meant on one occasion working for thirty-six hours on end. Later, at a rolling mill making steel plates for tanks, the men constantly worked a twelve-hour day seven days a week with one half-hour break. A lone psychologist found it difficult to persuade either management or union that shorter hours would probably mean higher production. However, eventually I did, with the expected result that output rose. One fascinating task was helping organizations to change their function; for example early in the war two Institute investigators helped a large football pool to transform itself within a week from offices to factories making parachutes and barrage balloons, but using the same supervisors and staff. Although the Institute was fortunate in recruiting Isabel Blain and a few others, it was a very depleted staff that remained at the eighth floor offices at Aldwych House (an awkward place when the lifts stopped during air raids) and they shared these offices with the equally depleted Institute of Personnel Management.

As with most organizations, the war years were immensely stimulating but difficult, and when peace came the Institute took some time to recover. Many of the staff left, some to remain in government departments, including

the newly-formed CSSB (Civil Service Selection Board) and others to enter academic life. It was difficult, for a time, to recruit replacements with suitable qualifications and experience.

The Research 'Fifties

During the late 'forties and right through the 'fifties the Institute's activities were changing and so was its atmosphere. Instead of being concerned almost entirely with industrial investigations and vocational guidance, emphasis was now laid on research and on training in personnel selection. With support from national and international bodies, several large scale studies were undertaken. To accommodate the increased staff, the Institute moved to its present premises in three houses in Welbeck Street, London. The move made staff communication more difficult; although the three houses were joined, people telephoned instead of visiting each other's offices as they did before. New staff were appointed, including David Cox, Bob Garforth, John Handyside and Sam Stringfellow and others engaged specifically for the researches. Some of the research staff fitted in excellently, others were less happy, and relationships tended to become more formal than they had been. Interests were, perhaps, more centred on individual projects and less on the Institute as a whole.

Industrial investigations continued but on a smaller scale. There were three main reasons for this diminution. First, most of the investigators were engaged in research. Secondly, the proliferation of Institute courses, begun under the direction of John Munro Fraser, for training personnel managers and others to use the Institute's methods of interviewing and testing, reduced the number of short investigations needed for introducing selection methods. Thirdly, whereas until the war the Institute was almost the sole organization applying occupational psychology, by the 'fifties there were a number of other concerns active in parts of the same field. These included bodies such as university departments and the Tavistock Institute of Human Relations and also several firms of industrial consultants. Therefore, people working at the Institute had less of the feeling of pioneering alone over a wide field; rather they were aware of having their own specific areas of expertise.

Vocational guidance continued under the direction of Harold Lock and the demand was such that there was a long waiting list.

Strengths and Limitations

Considering these years 1921 to 1961, the main strength of the Institute lay in its down-to-earth approach to projects. Its staff knew the smell of the back stairs of a factory and the problems associated with high labour turnover. They knew the kind of worries that beset people when they were in the wrong job or could not decide what career to follow. They also knew the excitement and pleasure of being able to help solve these problems and of having that help acknowledged. The Institute was successful at selecting its own staff so that there was always a lively group of people, mostly young, to stimulate and sharpen each other's wits. New ideas were initiated in vocational guidance,

selection, industrial training, attitude surveys and other matters. One concept that has had far-reaching application is Alec Rodger's 'seven point plan' together with the method of biographical interviewing. These two ideas must have prevented the misery of innumerable misplacements. The Institute was the main body in this country to devise intelligence and vocational tests and train people in their use, and also to introduce in industry the non-directive method of conducting attitude surveys. Many thousands of people were interviewed, from directors to juniors, to provide a basis for subsequent work.

One of the Institute's serious limitations was its shyness of publicity which contributed to its perpetual shortage of money. Few of its staff were good at speaking or writing about its work and the financial position resulted in only modest levels of either salary or physical working conditions.

SUBSEQUENT CAREERS OF STAFF

Occupational psychologists have been in short supply and a period at the Institute was known to be useful training; so the scientific staff often received spontaneous offers of other tempting jobs. It is interesting to see where they have gone and to consider the extent to which experience at the Institute may have influenced their subsequent work. This account of the activities of ex-staff is far from being a systematic study: indeed it is concerned with a highly prejudiced sample—those I have seen or heard about. They have mainly taken up work of five kinds: academic, industrial, industrial consultancy, government service and medical and clinical, although a good proportion entered quite other jobs.

Academic Jobs

There is a strong element of teaching in much of the Institute's work, not only in the many courses it runs and the lectures given at the request of numerous bodies, but, more subtly, in helping the staff of firms and other organizations to continue with the methods introduced on its advice. Therefore, it is not surprising that a large number of staff have taken up an academic life, whether at university, other adult educational establishments or, occasionally, schools.

At least five of the Institute's 'old boys' have become professors—Cyril Burt, Denys Harding, Leslie Hearnshaw, Rex Knight and Alec Rodger, as well as R. C. Oldfield who held a Leverhulme Research Studentship at the Institute for two years. Many others have become university readers and lecturers, including John Chadwick-Jones, Alan Cubbon, Margaret Knight, Joan Wynn Reeves and Dermot Straker. The centres for teaching occupational psychology founded at Birkbeck College by Alec Rodger and at Liverpool University by Leslie Hearnshaw and Dermot Straker reflect the influence of the Institute, as does the work at Aston University by John Munro Fraser. The cycle—being a student, having a period in research or in industry, a few years at the Institute, and back to the university to teach—is a fairly common one. Few, if any, of those who entered this field left it again except during the war. Several former members of the staff have helped with careers advice as

secretaries of University Appointments Boards, including J. G. W. Davies, Ian Kerr and John Crowther.

The more practically orientated colleges such as the Technological Universities and Polytechnics have attracted some ex-members of the Institute staff as lecturers. These included Bob Garforth, David Brasier-Creagh, Philip Limb, Mike Travis, David Williams and Brian Bartlett*. The variety of experience gained by working at a number of organizations for the NIIP must help considerably when giving management training.

Schools have not attracted many of the Institute's staff but two interesting headmasterships were held. H. A. T. Child, after being Chief Psychologist to the London County Council, became headmaster of Dartington Hall and, far back in the Institute's history, F. M. Earle was headmaster of Kirkcaldy High School. Both were deeply concerned with the vocational guidance of their pupils.

Industry

More ex-staff have entered industry and commerce than any other field except for academic work. The long period spent in a variety of organizations when on the Institute staff gives wide knowledge of conditions and of different methods of introducing change. However, being in a firm as an investigator does not allow permanent participation in its affairs and some people find it more satisfying to wield executive authority with long-term responsibility than to remain in an advisory capacity. Some of the past staff have gone directly into general management, others have entered personnel or training departments, often being promoted to general management later. Indeed the Institute seems to have been a good stepping stone towards reaching very senior positions. Alan Hudson Davies, Bill Williams and Martin Wilkinson became managing directors and B. D. Misselbrook became chairman—all of important companies. A number of others became directors, including John Hopkins and J. G. W. Davies, who is now an executive director of the Bank of England. Naturally many chose to remain in personnel or training work where they could apply directly methods originated by the Institute. These included John Handyside, F. W. Lawe, Harold Lock, Alan Stewart, Sam Stringfellow and Bernard Ungerson.

Industrial Consultancy

The story of the Institute's relations with consultants is a varied one. In the early days when there were only one or two highly respected firms, such as Urwick Orr, they had fringe overlap and friendly contact with the Institute. Then, in the 'thirties, consultancy firms proliferated. Some did excellent work but others restricted their aims entirely to increasing output, and with these relationships were cool. After World War II an enormous number of consultancy firms, large and small, became active, some with similar aims to those of the Institute, and it was these that obtained the Institute's staff. Some of the work now done by the more progressive industrial consultant firms covers the same ground as work formerly done by the Institute but it is

*And several others during the 'sixties.—Ed.

often better paid. Sometimes consultancy gives people better opportunities to run their own concern and possibly to specialize in one type of work, such as management selection. The influence of the Institute is seen directly in the work that many consultants do; indeed some are now *'plus royaliste que le roi'* in continuing work started at the Institute. A number of ex-staff have become consultants running their own firm like David Duncan, Mackenzie Davey (who has many past NIIP staff working for him), W. D. Seymour and, in New Zealand, Bret Harding. Others have joined one of the big consultant organizations in a senior capacity; these included E. C. Daniels, Peter Reeve and Arthur Stephenson.

Government Service

Several government departments, at home and overseas, have recruited staff from the Institute. These have included people for defence service research (including N. A. B. Wilson in the Navy Department and Jack Jennings in the Royal New Zealand Navy), for the prison service (Aymeric Straker directing a team of sixty-five psychologists), and for the careers advisory service (G. E. T. Whiting was Chief Inspector of the Youth Employment Service in U.K. and V. W. Wilson held a similar position in Singapore). Others entered a wide variety of positions—Sheila Bevington became a factory inspector, Roma Morton Williams joined the Government Social Survey, Alec Rodger was for a time consulting psychologist to the Ministry of Labour and Mary Speak is in the Research Division of the Civil Service Department. The Institute has provided directors for two of the Industrial Training Boards: Roy Butler for agriculture and Stanley Thorley for the gas industry, and chairman for one—B. D. Misselbrook for the construction industry; he is also chairman of two of the 'Little Neddies'. Work in such positions shows direct relationship with activities at the Institute. Other people have been more concerned with general administration, such as James Mitchell at the National Coal Board and Edith Mercer at the Ministry of Overseas Development. International work has appealed to some, such as Peter Castle at the International Labour Organization and P. B. Home as the Chief of Technical Appointments, U.N., Geneva.

Medical and Clinical Work

A few past staff members have entered the medical field. Some of these were doctors, such as Sidney Crown, Alan Mohun and Angus Macrae, who became Secretary of the British Medical Association. Others worked in the psychological field either as analysts or advisers in child guidance clinics—Marion Milner, Eileen Orford and Nancy Salamon. It is probable that experience of vocational guidance influenced some of this group in their choice of further occupation; my own experience of attitude surveys in industry has led me directly to undertaking similar surveys with patients in hospitals.

Other Work

These are five main types of job taken by staff after leaving the Institute; many others did not conform to these patterns of choice but yet, in their

various activities, may have been influenced by what they learnt at the Institute. They include Nigel Balchin with his novels, Gladys Blunt on the staff of the British Psychological Society, Ian Gordon Brown, Director of the Industrial Co-Partnership Association and Helen Roberts undertaking social work.

No fewer than five Presidents of the British Psychological Society have been former members of Institute staff—Charles Myers, Cyril Burt, Leslie Hearnshaw, Rex Knight and Alec Rodger. Bernard Ungerson was President of the Institute of Personnel Management.

This short article is not the result of a careful analysis but is based on impressions, memory and personal knowledge. Apologies will be due to many whose names have not been mentioned or who have changed their jobs since information was available or who served on the staff only after 1961. Sources of influence can seldom be traced with certainty, but it seems sure that, though the Institute may be a comparatively small organization, it has had and is having through its former staff an immensely wide influence on the community.

PROBLEMS OF TEST PRODUCTION AND SUPPLY

D. F. VINCENT

Formerly in charge of Test Section, National Institute of Industrial Psychology, 1945-1967

ARTICLES ABOUT TESTS, if they are non-technical, deal mainly with testing and what can, and cannot, be achieved by tests. This article is intended to present the back-stage view, that is, to describe the problems of the people who construct and supply tests.

Tests are as old as mankind. Two are described in the Old Testament and each illustrates one of the difficulties which beset test designers today. In the Book of Judges the pronunciation of the 'sh' sound in the word Shibboleth was used as a test of nationality. This test has the defect of unreliability. Today, all Englishmen can make the 'th' sound while most Frenchmen and Germans cannot, but the pronunciation of this sound would make an unreliable test of nationality since there are some French and Germans who can pronounce it as well as an Englishman. Again, in the story of Susannah and the Elders there is a vivid description of a type of test still in use today. Two witnesses suspected of rehearsed evidence and perjury were questioned separately about minor details in their story. They had not agreed about what they regarded as trivialities and gave themselves away. This test has the defect that it can be invalidated by sophistication. Experienced (i.e. sophisticated) rogues would say "I don't remember" to any question outside their agreed story.

The old-time tests were all for traits of personality; that is they were tests of preference, nationality, arrogance, greed, veracity, honesty. Tests of intelligence appeared about the turn of the century. The earliest were mostly puzzle tasks suitable for children: fitting back the arms and legs of a dismembered wooden figure, assembling pieces of plywood to form a face, form-boards (very simple jigsaw puzzles), puzzle mazes. These introduced a new defect; they could be compromised, that is to say the test would be worthless if the child tested had seen it before, especially if he had been shown how to do it.

Binet and Simon made probably the first definite attempt to evolve tests which would be both reliable and difficult to compromise. They acted on the theory that, if a number of tests of the same level of difficulty are given, the proportion of successes is a more reliable index of ability than success or failure at any one test. Some tests are not easily compromised: for instance, if a child is asked to repeat a sequence of five or six figures this is unlikely to be compromised because there are far too many such sequences. A series

of such tests produced what were probably the first trustworthy juvenile intelligence tests, the ancestors of the Stanford Binet tests in use today.

Still another hazard in test construction was appreciated as a result of the work of the great pioneer Spearman. Because a test has been designed to measure something, say, intelligence, it does not necessarily do so. Spearman showed that the scoring on such a test always depends partly on intelligence and partly on something else. He produced two papers in 1904: one demonstrated a method of measuring the extent to which intelligence determined the scoring; the other described, among other things, methods for measuring the reliability of tests.

Pioneer Test Work at NIIP

From the early nineteen hundreds test methods steadily improved and a growing interest in the use of tests developed, but it was not until the early nineteen-twenties that there arose a general demand for them. To meet this demand the National Institute of Industrial Psychology soon after its inception in 1921 became the first body in England to embark on research into test construction. Two of the first four reports it issued (Earle *et al.*, 1929, 1930), were accounts of some of this work.

There are five essentials for an efficient test. They are:

1. that it is reliable;
2. that it measures what it was designed to measure (i.e. that it is valid);
3. that it is properly administered;
4. that it has not been compromised: i.e. that none of the persons tested has had any previous experience with it;
5. that none of the persons tested has been able to practise with similar tests (sophistication).

In its early days the NIIP did not supply tests to others, and all testing was done by its own staff. It had no worries, therefore, about the third and fourth of these essentials, and only many years later did the fifth become a problem. It was able to concentrate on the first two and the methods were direct. A new test would be tried out on a group of the people for whom it was required. A test for mechanical ability, for instance, could be tried out on a group of apprentices to engineering trades or on a group of school children who were taking practical subjects. Such trial and error methods were slow but they produced tests that worked.

The dangers from maladministration, which were negligible when tests were used only by a few psychologists, became apparent with the increasing demand for them both from education and from industry. The NIIP adopted the policy of supplying tests only when it could reasonably be supposed that the person supplied was capable of administering them efficiently. This meant that in practice tests were supplied without question to psychologists and to teachers. A company could obtain a test only when one or more members of its staff had received instruction in its use. Classes to teach the administration and use of a small battery of tests were started at the Institute in the nineteen-twenties.

The NIIP was about ten years old when I, myself, joined the staff and by then test work had settled down to a fairly steady pattern. For educational bodies, psychologists and research workers there was a comprehensive set of pencil and paper tests consisting of three intelligence tests, two clerical tests and a spatial test; in addition, involving the use of apparatus, were two tests of mechanical ability, two tests of manual dexterity and two or three performance tests of intelligence. These tests were also used in industrial work though it was more usual to develop for a firm special tests for its own use. There were typed reports of all test work that had been done by the NIIP for various firms, quite a library in itself, and there was also an extensive library which contained every or almost every book on test work that had been published in English. The staff believed that they were able to produce a test to meet almost any requirement. The procedures they advocated would be considered crude and clumsy today, forty years later, but firms were satisfied and it is unlikely that anyone at that time could have produced anything better.

In the nineteen-thirties, work on industrial tests became more ambitious. Attempts were being made to predict potential skill. A member of NIIP staff working on the spot would study an industrial operation and decide at which parts of it an operative was most likely to do something that would waste time or material. He would then try to devise a piece of test apparatus that would present the same situation to a newcomer. It had to be simple and durable and it had to be made up from materials that were available. Sometimes this was a problem and there would be a conference at the Institute. Usually someone would come up with a promising idea. But an idea was of little use until it had been translated into a working model. I could always do that, and quickly. All my life I have had the handy knack of being able to improvise something that would work from bits and pieces that were at hand; that is how I drifted into test production.

There was a steady increase in the complexity of the tests produced. The most complicated gadgets were those evolved in a research into accident proneness in car drivers. The most spectacular was a dummy car of plywood with a real steering wheel and pedals. A screen hung in front of the bonnet; a picture on the screen obeyed the wheel and pedals. The picture showed a rural landscape and when the driver came to a turning he could either take it or drive straight on. He could at any time, if he wished, make a hundred and eighty degree turn and go back the way he had come, always provided he chose a place where the road was wide enough for a turn and he did not crash the car into a hedge. The illusion of actual movement was very strong and a crash was quite startling. (I tried to make it more real by arranging that a 'crash' should close an electric circuit which actuated a device that dropped a sash-weight on to the end of a plank, the other end of which was under the driving seat. The Director vetoed this addition; he said that he did not want a case of heart failure.) The picture was not produced by a cine-projector as it was in training devices that appeared after the Second World War, but was a projection of a portion of a model landscape and beneath the model was a plan over which a pen travelled plotting the precise track taken by the driver

and recording his speech. This device was not a toy though many people visited the NIIP on one pretext or another whose real object was to 'have a go'. This apparatus was intended for research and it was used for research; once it was lent for an investigation of what effect 'just one drink' had on a driver's skill. Once it was co-opted into medical research for studying the effects of the disease known as general paralysis of the insane. Antibiotics were unknown then, but a cure had been found by infecting the victim with a type of malaria. There were grave doubts about whether a victim could be made normal again. The NIIP device showed that, whatever deficiencies a cured man might have, he recovered his ability to drive a car.

This apparatus was also used as one of a series of tests for accident proneness. They were not unsuccessful as tests, in fact they had the backing of two insurance companies, but their expense made them unsuccessful financially.

Post-War Developments

During World War II there was an enormous amount of testing in the Services. Almost everybody knew about it; people became test-conscious, but it was the pencil and paper type of test that was popular. The old analogous tests and the tests involving apparatus were now regarded as too slow. With them people had to be tested singly, or at best in twos or threes, and each testing took a long time. With pencil and paper tests people could be tested in dozens or hundreds quickly and simultaneously. From 1946 onwards there was a large demand for pencil and paper tests and queries were received by post and telephone every day.

Some requests were from firms or institutions to whom we had an obligation to supply tests, and others were from organizations that we were willing to supply provided we could be sure that the tests would be efficiently administered. Some, however, were from people without any qualifications to use tests, and some people wanted copies of tests to provide practice in doing them. Every new applicant had to be 'vetted'. All this involved more work than one person could handle and to cope with it I started the NIIP Test Section. We also undertook the work of producing new pencil and paper tests and of test research.

Test Construction and Standardization

There are some who imagine that it is a simple matter to think up a few suitable questions for a test. Perhaps it is, but that is less than one per cent of the whole job. It is necessary to begin with far more questions than will be required for the final test; fewer than four times as many means taking risks. These questions have to be assembled into three or four 'trial' test booklets. Each of these trial tests has to be administered to a group of three or four hundred people who must be given adequate time to answer all the questions that they can. The trial group must be representative of the class of people for whom the test is intended. After the administration of the trial tests, there comes the marking, the item analysis, the checking and the standardization.

Obtaining a suitable trial group was in my experience always the most irksome and time-consuming part of the whole job. The numbers making up the group for a trial test need not all be in the same place and it is unimportant when and where the trial tests are given, but the numbers must be found. Likely sources of suitable people have to be sought and persons in authority approached and persuaded. Often I found myself involved in lengthy correspondence and delays. Occasionally the co-operation of an education authority was obtained and then it was plain sailing; but this was the exception, because NIIP needed tests for people of school-leaving age and upwards, while education authorities were more interested in tests for lower ages. In the industrial field plenty of co-operation was offered but the numbers available for testing in each company were usually small. So a large number of companies had to be approached and the testing had to be done at their convenience, usually once or twice each year. All in all, getting an adequate number of worked trial tests was a slow and exasperating business.

The marking of three or four hundred booklets of each of three or four trial tests involves a great deal of work, especially as a rather meticulous form of marking is necessary for an item analysis.

A thorough item analysis is a complicated operation but the principles involved are simple enough. A simple form is to sort out a group of people with the highest scores and a group with the lowest scores on the test as a whole, say, twenty-five per cent in each group. A really good question, or item, would be answered correctly by nearly all the high-scoring group but nearly all the low-scoring group would be unable to answer it. With a really bad item there would be as many correct answers given by the low scoring group as were given by the high scorers. In practice, there are not only good and bad items but every shade in between; an index of the worth-whileness of every item is required. To be effective, such an index always requires a lot of computational work. A second function of item analysis is to provide an index of the level of difficulty of each item, which is shown by the proportion of correct answers.

It always happens that many of the items, or questions, are not satisfactory and have to be discarded. A trial test is successful if there are enough good questions left to make up a test with some questions easy enough for everyone to answer, some questions difficult enough to baffle all but a few of the ablest, and an adequate range of questions of all intermediate stages of difficulty.

The next stage is checking the reliability and the factor content. 'Reliability' is a technical term for a numerical measurement of how accurately a test measures whatever it does measure, which may not be exactly what it was intended to measure. The factor content gives an indication of what it actually measures. For the checking, the new test together with a number of other tests has to be administered to a suitable group of people. The correlations between the scores of each test and every other test in the group have to be calculated. The correlation coefficients so obtained provide the material for more computation. All straightforward work but a lot of it. Nowadays some of the work can be done by computer.

Standardization is the next stage. A test is of little use until it is known what level of ability is indicated by each particular score. The percentile system was, and still is, used at the NIIP. (For people unfamiliar with test work, it should be explained that a percentile rating of, say, 25 implies that out of a very large group 25 per cent would not get any higher score.) Percentile ratings are, of course, relative to a particular group and it is essential that this group should be truly representative of some population. A population may be all boys between the ages of nine and ten, or all candidates for apprenticeship at some type of engineering, or all women students at certain universities, or . . . almost anything. A test is designed for some particular population and initially percentiles are obtained only for that population. My difficulty was always in finding an effectively representative group. Later, percentiles would be found for other populations; the more of them, the more useful the test. The Test Data Record contained many pages of percentiles for those tests most frequently used.

The production of a good pencil and paper test involves an enormous amount of work for a number of people. I have heard it asserted that a good test can be produced singlehanded. Some people believe in fairies.

Safeguards

Worthwhile tests are undoubtedly expensive to produce and that is one reason why NIIP has always taken every precaution to ensure that they do not get into the hands of incompetent users and become discredited or compromised; but there is another and more important reason; incompetent test administrators can be dangerous.

For example, a boy of school-leaving age was brought to the Institute for advice about a career. During the preliminary interview his parents stated that their son was of exceptionally high intelligence; years before a 'psychologist' had given him a test that showed he had an I.Q. of 180 (or something improbably high). For years they had put aside every penny they could so that their genius should have a proper start in life. He was a pleasant lad but efficient testing showed that he was of no more than average intelligence.

The reverse of this case is also common. It is characteristic of the incompetent test administrator to get spuriously low scores. A youngster who, as a result of bad testing, has been made to believe that he is dull can easily convince himself that he will never be able to keep up with his school-fellows. He may be intelligent but that will not save him if he is suggestible.

A false verdict of low intelligence, even when it does not worry the child, can have a serious effect on the parents. I had a vivid experience of this in my own family. A small relative was sent to a private preparatory school. When he had been there for a year or so, and was about nine or ten, it was discovered that he could not read a word. His mother dashed off to have it out with the headmaster. He told her that he had tested the boy and found that he was of very low mentality and that it was probable he never would be able to read. The mother was frantic. She did not doubt the man's ability to test; she believed that a schoolmaster ought to know all about testing. There was no doubt about her son's inability to read, but she was

determined that he should be cured; hypnotism, hormones, surgery even. As a first step a further test for the boy was arranged. The verdict was that he was actually rather bright but was an obstinate little beggar who would not bother to learn anything that did not interest him. He was transferred to a less archaic school where not so much was thought of games and more of making the school work interesting. There he not only caught up but did rather well; later he took a degree in medicine. I do not know how far that schoolmaster was to blame; he certainly should never have been trusted with a test, but I knew the youngster and I have a feeling that he could have put up a convincing display of stupidity if he thought that it was a good way of dodging school lessons.

Maladministration can take many forms: not making sure that the person taking the test knows what to do; not making sure that he records the answer in the right way; inaccurate timing; faulty marking. The most disastrous form of all is tampering with the test, for example, by rewording the instructions, omitting a part of them thought to be unimportant, or making additions to 'improve' them. Altering the questions or omitting part of a test itself is quite inexcusable, but, incredibly, it is sometimes done.

An order for a dozen copies of Group Test 33 was once received at NIIP from an unknown person. In reply to the usual letter asking for credentials, the writer stated indignantly that she had been using this test for years and that she only wanted a few new booklets as those that she was using were nearly worn out. But in Group Test 33 all the answers were made by underlining a word and the booklets could be used once only. Enquiry showed that the writer, who appeared to hold a position of responsibility, had been rubbing out the answers and using the same booklets again and again. Anyone tested by her could have got nearly full marks by underlining where there had been most rubbing out.

Apart from the misuse of tests in ways that are damaging to the person tested, there are other kinds of misuse that are detrimental to the tests. To guard against such situations NIIP had to make strict regulations for the supply of tests. The credentials of everyone who applied for tests had to be checked, and a register of all people authorized to use NIIP tests was kept. As a safeguard against unwarranted claims and against leakage and passing on a record was made of where and to whom every parcel of tests was sent (over 30,000 copies a year of some tests). Further, there was a record of which tests went to every town in England and of who was using them.

It could not always be assumed that a person qualified to give tests could safely be trusted with them, so a Conditions of Supply Agreement was formulated. This stated that tests supplied

- should be used only for bona fide testing,
- should not be used for coaching,
- should be kept under lock and key,
- should be destroyed once they had been used,
- should not be used for entertainment,
- should not be passed on to any third person without the prior consent of NIIP.

Today's conditions of supply cover essentially the same points. The signature to such an agreement may not be legally binding but in the event of violation further supplies of tests can be, and have been, refused.

To meet an increasing demand for efficient test administrators in industry, NIIP introduced in the nineteen-forties courses in the use of intelligence tests. They were later modified and extended; they give a good idea of the problems and snags in test work, what can be accomplished by tests, and what tests cannot do. They include practice in test administration and test marking. Those who pass through the courses are registered as authorized to use certain NIIP tests, and undertake to contribute data needed for standardization and for revision of norms.

During the nineteen-fifties the demand for tests grew rapidly and increasing numbers were supplied by commercial organizations. These have to make a profit and cannot spend time checking the bona fides of every customer. Commercially produced tests aggravated the problems of test sophistication.

Test Sophistication and Other Problems

Of the five cardinal problems of test work, reliability and validity are the responsibility of the test designer, the avoidance of maladministration and compromise are the responsibility of the supplier, but the fifth, sophistication, is at present no one's responsibility.

No test is of much value to assess anyone who has had practice with similar tests: he is said to be 'sophisticated'. The amount of sophistication arising from a person having been previously given one similar but different test is small, but if he has been given several similar tests the effect could be serious. Accidental sophistication arising from increased use of tests has not been a great problem, but the deliberate coaching of candidates, or fraudulent sophistication, has. It bedevilled the educational world when teachers began to coach pupils with tests similar to those they knew were being used by their local education authority in the eleven-plus examinations. The 'tests' used were home-made and probably bad as psychological tests, but they were effective enough for coaching. This practice could not be stopped; forbidding it in school would make little difference since there was no control over parents.

Fraudulent sophistication has been serious outside the educational field in other countries. One organization in the USA produced a comprehensive set of selection tests for male nurses. NIIP later received a publisher's sample of a coaching manual, a quarto book about an inch thick with first-class paper and printing; quite an expensive job. It contained a large number of duplicates of the tests and practical instructions for a coaching course. Judging by the duplicates, the tests looked good and were no doubt the result of much hard work by competent designers; but that coaching book made them completely worthless.

Pirating is another bugbear of test producers. Often enough new tests are produced on similar lines to old ones, but this is not regarded as piracy; there is no monopoly in design. Piracy is utilizing the actual questions from

someone else's test. One pirate that I remember produced a five-part spatial test; the first part was his own work but the other four parts were taken quite unchanged from an NIIP test. He was unlucky; the publisher to whom he submitted his test sent it to NIIP for expert advice about its value.

A sample test sent by a foreign publisher was a blatant piece of piracy. In some countries tests had to be in duplicate versions described as Form A and Form B. The pirate had taken an NIIP test and used questions 1, 3, 5, 7, etc., for Form A and questions 2, 4, 6, 8, etc., for Form B. He was an ignorant rogue. The questions of a good test form a sequence and removing earlier questions may invalidate later ones. Also, tests must not be too long so a good test contains enough questions to give it an adequately high reliability and no more; cutting a good test in half would seriously reduce the reliability.

The incidents I have recorded were some highlights of my work. A very great deal of it was humdrum routine. There were endless queries about tests both by letter and telephone and the same old replies had to be made. Every application for tests had to be vetted and that meant records to be examined; these records had to be accurate and they had to be kept up to date. Only the Test Data Record gave me any real pleasure. It contained all the data on NIIP tests that I had collected in twenty-two years: percentiles, means, standard deviations, reliabilities, correlations, factor loadings. I wondered, when I retired and handed them over to my successor, how much time had been spent computing them; and whether my motives had been different from those of a collector of postage stamps.

(Mr. Vincent's motives may have been those of a collector, but his contribution to the satisfaction and satisfactoriness of the people who took and are taking his tests, whether for vocational guidance or selection, is incalculable.—Ed.)

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ORGANIZATION OF REPETITIVE TASKS SOME SHOP FLOOR EXPERIMENTS RECALLED

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The author, formerly on the staff of NIIP, describes some early post-war research. Problems of criteria, controls and apparatus, still topical and unsolved, are illustrated, and also the values of a disciplined subjective approach to shop floor studies.

BACKGROUND

THE INDUSTRIAL REVOLUTION brought about large-scale production methods; year by year these became more and more closely planned and controlled. Adam Smith, in his *Wealth of Nations*, published in 1776, had advocated the virtues of the division of labour, and through the nineteenth century the tendency was to replace the craftsman's discretion and judgement with management's decisions on methods, materials, tools and speed of working. By the end of the century, F. W. Taylor and F. B. Gilbreth in the United States of America had begun to develop 'time and motion study', as it was then known, as part of scientific management. They and their followers believed strongly (in the early twentieth century, anyway) in 'the one best way', carefully planned by experts, who left little or no chance of flexibility or initiative to the operator. Nor did it leave the operator much choice of working speed.

Between 1920 and 1939 this 'classical' type of work study was brought to this country, mainly by Charles Bedaux, an industrial consultant—one might say, the first industrial consultant. The aim was greater output with as many men, or the same output with fewer men; this latter did not make it popular in a time of heavy unemployment. The method was a rigid application of principles of motion study which, while physically logical, may have been psychologically suspect.

Labour shortages during World War II led to a rapid adoption of these ideas by an increasing number of organizations; more output with a minimum labour force was the aim, encouraged by Government and accepted by trade unions. Some psychologists began to question whether the work study men were going too far, and becoming too mechanistic in their way of thinking. There seemed to be too much reliance on such concepts as 'the one best method' and sheer arithmetic—0.40 minutes per piece=150 pieces per hour=1200 pieces in 8 hours is logical, but not necessarily true. *People* are not always logical: for example, the Health of Munitions Workers'

Committee (1917) had shown long before that 1200 pieces in 8 hours does not by any means equate with 1800 pieces in 12 hours.

In 1948 the National Institute of Industrial Psychology began some research in this area on behalf of the Human Factors Panel of the Committee on Industrial Productivity. There were, of course, economic and political overtones to the adoption of 'efficiency systems'. The Institute was in no way concerned with these, or with payment systems, but only with the organization of work at bench level.

GENERAL PLAN OF RESEARCH

The research, originally referred to as the Unit of Work (Cox and Dyce Sharp 1951), and later as Organization of Repetitive Tasks, started off in two areas simultaneously: breakdown of tasks, and batch size.

Breakdown of Tasks

In many manufacturing processes, it had been found convenient to adopt a flow-line principle. For example, with radio sets, there might be 200 components to solder in. (Printed circuits were rare in the 1950s.) The first girl in a line would put in 10 components, push the chassis along to the next to put in 10 more, and so on; the line would require 20 girls. Actually each girl might put in more or less than 10 components; the number would be adjusted to make their individual tasks about equal in terms of allowed time.

This method had obvious advantages, not least the small amount of training involved. A girl could fairly soon learn to put 10 small items in the right places; learning 200 steps would take much longer. It had certain obvious disadvantages; it was not always easy for the work study man to balance the 20 jobs, and when he had, everyone had to work at the same pace.

From a purely psychological standpoint we questioned whether such a small task frequently repeated—a common cycle time was between 15 and 60 seconds—might fail to satisfy the worker. Was it a case of "We want your hands and eyes for eight hours a day, but leave your brain and personality in the locker with your coat"?

Batch Size

In many repetitive tasks, material is brought to the operator in batches. It had been noticed in a much earlier NIIP investigation (Harding 1929) that batch size can be important. Girls preparing blackcurrants in a jam factory handled two 7-lb trays faster than one 14-lb tray. There was no logical reason; to use a Lancashire phrase, the bigger tray 'overfaced' them. We felt that this phenomenon would be worth examining; if there was evidence of a preferred batch size, then here was a way of getting at least a small productivity increase with remarkably little outlay.

Method of Approach

Our original aim was to carry out experiments which were basically simple. On batch size, we would try various batches and observe effects, chiefly

on the rate of output. The same working group would be used, and the only difficulty in control appeared to be that of maintaining uniform conditions of quality of material, environment, and so on.

On breakdown of tasks the problems would, we realized, be greater. The ideal experiment might be described thus: take a task which, in total, occupies T minutes. Suppose it is at present split among N operators, who thus each carry out a sub-task which averages T/N minutes. Then let us get the total task done by P operators, each doing a sub-task of duration T/P minutes. P would, usually, be $\frac{1}{2}$ or $\frac{1}{3}$ or $\frac{1}{4}$ of N —i.e. fewer operators would each be doing a larger sub-task.

So much for the variable. The criteria would be primarily rate of output, but also absenteeism, turnover, and so on as far as they could be reliably measured on a small group over a limited period.

Ideally, we would observe two groups concurrently, one of N operators and one of P operators doing the same basic main task. Problems of matching groups obviously would arise, and of maintaining similar conditions with regard to such things as quality of material.

Problems

We first set out to find suitable jobs in industry. The NIIP's fund of experience (and of goodwill) gave us an excellent start. Before long we had contact with a surprising number of companies willing to let us come and look to see if what they did would be suitable for experiment.

Discouragement arrived with the next stage, visits to factories. Subdivided jobs existed in profusion, often with the individual operator doing no more than a 10–15 second cycle. But, unfortunately, that individual operator often used a large piece of equipment—a fly-press or a flash welding machine, for example—to do this short sub-task, and there just was not room to allow one operator to work two or three such devices.

The most likely work was the assembly of electronic equipment, using only a soldering iron and one or two small hand tools. Again, however, we ran into difficulties. A factory making thousands of radio sets was in fact making some dozens of different models, and on any one model could not justify more than the one existing assembly line. A second experimental line was obviously going to create a large unsaleable surplus of the model in question, while a complete reallocation of tasks on the one line would, for the time at least, hold up the existing production.

An obvious case for investigation was motor-car assembly, the mechanized line in its most rigid form, but as a field for experiment it was useless. Tooling up a line costs at least tens of thousands of pounds; to equip and run a second line for experimental purposes was out of the question.

RESULTS

Breakdown of Tasks: Some Insights

We did manage to run a few experiments. One was on radio assembly: the total job was of about twenty minutes' duration, i.e. about one minute's

work per set for each of the twenty or so women working on the original line. It gave inconclusive results, with one exception: one operator became so interested that she volunteered to set up at a bench on her own to do the whole job. This was arranged, and her output soon began to exceed the output per head of the normal line. She was not by any means an average operator, however; the interviews we had with her, as with all the operators involved, made this obvious.

Of really significant experimental results, we had hardly any, but of interesting information we had a lot—interesting in the sense that it might be followed up. Monotony, and boredom or fatigue due to monotony, seemed very elusive. One could define a task as more or less repetitive according to its cycle time; boredom was something experienced by the worker and, to judge from comments and observable behaviour, might be quite unrelated to the task itself.

Breakdown of Tasks: a Fallacy

At least one point of obvious importance to work study men and planners became very clear: no one person works, from choice, at a uniform pace. If several people work together on a rigid line system, they will almost certainly get the line speed to fit troughs in the individual's work-graph rather than to fit the average of that graph. Since different people do not necessarily peak and trough at the same time, it follows that a rigid system of several operators will almost certainly work at a slower rate than the average of those operators working individually. One way to obviate this hindrance is to free individuals from strict line speed, by providing buffer stocks of material between work stations. The size of buffer stock needed would depend on the degree of variability in an individual's working rate.

Batch Size: the Time Dimension

Batch size experiments were easier to organize, and showed more sign of significant results, though not enough to satisfy the usual criterion of 95 per cent probability. One experiment on inspection of electric lamp bulbs seemed ideal; the glass bulbs were handled in easily adjustable quantities. Although the batch size seemed to affect experienced operators very little, larger batches gave some sign of slower working by trainees. There was the suggestion that batch size, to the operator, is not so much the physical quantity as the time it takes to do, and that trainees, being slower, are more susceptible to the wearying effect of a long task.

Another interesting experiment was on pairs of men operating tube-drawing benches. Batches here were random, being order quantities, and the rate of working tended to be faster for batches which were of medium size than for larger or smaller ones. During the experiments a change in the piece rate system was introduced; this influenced earnings but the batch size effect, such as it was, remained the same. The indications were that the time taken to do a batch may be the real measure of size, although accepted statistical criteria again say 'suggestive but not proven'.

Variation in Working Rate

One department in the tube works offered a good chance to investigate variations in working rate. In this department, semi-finished tubes were drawn, one at a time, to smaller diameter; a wide variety of tube diameters were handled. Two men worked each draw bench, and it was a moderately heavy job. We devised equipment to count production automatically. A switch on each draw bench was connected to a GPO-type counter; a block of up to sixteen counters was photographed automatically at five-minute intervals, night and day. (The whole device was in a travelling box which passed as 'Passengers' Luggage'—travel by car was limited in those days.) Our first trouble was to get the switches adjusted to count accurately under conditions of vibration; we could do this only between 6.00 p.m. and 8.00 p.m. between shifts. (Draw bench lubricant is very dirty, and the smell lingers for days!) The real chore, however, was to decipher the film record; 16 counters, each showing 4 digits, 12 exposures per hour, 2 shifts per day—and so on. Our research assistant deserves honourable mention for doing this task, perhaps the most repetitive ever done in the Institute. All in all, little came of this exercise, except a feeling that if we had used better equipment, we should have found worthwhile results.

SETAR Study of Variation in Working Rate

Further study of variation in working rate nevertheless seemed worthwhile for at least two reasons. Practically, it could influence the organization of tasks, suggesting the provision that should be made for buffer stocks to relieve the pacing effect of a conveyor line. Psychologically, it might throw light on people's working habits; at least it would offer a chance of measuring something objectively, instead of making estimates subjectively. Work curves had been of interest since the 1920s, being first commented on in Industrial Fatigue Research Board researches (Osborne 1919). So a new approach was tried.

With the help of the Cambridge Psychological Laboratory we made a version of the SETAR device which would give us a punched tape record of times down to tenths of a second on eight separate channels. This seemed ideal. In practice, however, the peripheral sensors feeding to the device were a great problem, and SETAR was not really suitable for eight-hours-a-day operation. Moreover, computer analysis of results was at that time (1954) less accessible than it is now. The attempt had to be abandoned.

OBSERVATION AND INTERVIEW

When it became evident that direct experiments on job breakdown and batch size and attempts to measure rate of working were not likely to tell us much, we turned to a basically subjective method of interviewing operators to obtain their reaction to repetitive work. We also conducted pretty exhaustive job studies, bearing in mind factors which might be expected to contribute to 'monotony'. This study is described in NIIP Report 9 (Cox *et al.* 1953).

Job Study

This took particular account of the degree of routine, covering such points as:

- the extent to which the job might introduce occasional tasks away from the routine main task;
- rotation, whether operators could move around a small group, exchanging sub-tasks for a period;
- pacing, the degree to which the job was paced by machine, or by the general pace of a group;
- variety of material worked on (size, type, colour, etc.);
- variation of method within the operator's control.

We also noted other more obvious points: difficulty of the job (measured in terms of how long it took to learn), extent of delays, physical environment, and, of course, inter-relations with fellow operators.

Method of Interview

NIIP attitude surveys at the time of these studies were normally based on an almost completely free interview. The only direction given was in explaining, and not too specifically, what it was all about. The interviews in this research were similar, but with rather more direction. Controlled stimulus was given by spoken words, and by cards displayed; each of the fifteen cards had one remark such as 'pace of work', 'having to keep up a high standard of quality', 'a chance to be with other people'. These were later used as a ranking device, by asking the operator to pick out what seemed to her the most and least important aspects of the job. But the interview was left sufficiently open to allow the operator to enlarge on any topic that, however remotely, had a bearing on the job.

Results

'One man's meat is another man's poison' is at first sight a fair comment on the attitudes recorded in the interviews. Take pacing, for example: some liked it, some did not. Yet more careful analysis suggests that it was not always fast pacing that was disliked; slow pacing was disliked too. It seemed that pacing, together with very rigid control of job methods, is a form of constraint. One suggested distinction between work and enjoyment is that the former involves constraint, starting from the obvious one of being in a stated place at a certain time. The more rigid the work organization, the greater the constraint.

Skill, i.e. acquiring dexterity to do a limited task rapidly, is clearly one important point. 'The only skill in this job is doing it fast' was clearly true in many cases; anyone could learn how to do it slowly. The implications led to further NIIP work (Vincent 1955) on speed and precision in manual skill. Skill, as discussed here, is rather more a matter of dexterity than of skill, in the sense of 'a skilled man', i.e. one who has served an apprenticeship. In this latter sense, all these jobs were 'unskilled', yet they needed some capacity which is partly the result of training, and perhaps partly innate.

On attention to the job, our findings tended to agree with the much earlier ones of the Industrial Fatigue Research Board (Wyatt *et al.* 1929), that a job calling for one's full attention or none at all is preferred to a job which calls for steady perceptual attention but makes few intellectual demands. This last type neither interests the operator, nor allows her to talk, think of other things, and so on. It calls for a half-person.

A well-organized job gave more satisfaction than an inefficient one. "Since we are here, let's get on with the job" was the usual attitude, whether pay was related to production or not. Delays were generally disliked.

OUTCOME

There was little to show for these years of research in terms of neat well-ordered figures leading to statistically significant conclusions. In a field where organization of the task is only one factor among many which influence a worker's behaviour and attitude this is not surprising.

We knew our equipment was not as reliable as it should be; one lesson is that, in this sort of work, one must face the cost of providing apparatus that will be reliable over long periods. Then having got the data, one must also have access to computers to analyse them; there is too much material for manual analysis.

One could question the need to reject results which do not reach the 95 per cent level of probability. Some looser criterion might still give useful pointers to industry, where so many decisions are made on slightly better than even chances.

Variation in working rate through the day under various conditions still seems to be one of the few measurable factors which may be an indication of mental reaction to the job. Mathematical analysis of this type of variation, though elaborate, is now well within the normal capacity of computers. Physiologists are reporting a relation between heart rate variations and mental activity. Apart from an obvious parallel, it is worth noting that the mathematical analysis of heart rate variations poses similar problems to those involved in analysing variation in working rate.

In wider terms, perhaps we helped in a move to 'humanize' production work. When we sought to establish experiments, back in 1948, a few firms agreed that our problems were worth investigating, but more of them, even among the more enlightened, doubted if the problems existed. Nowadays, one hears quite a lot about 'job enrichment' under one name or another, which suggests that the existence of a problem has been generally admitted. One might give some thought to the car building industry, which combines rigidity of work organization and high wages with a fair degree of unrest.

Are our modern wage problems due in part to bad work organization? Are we unwittingly paying more than the job is really worth because it is so monotonous? Are we, in fact, bribing people to overcome an obstacle, instead of removing it from their path? Some people are still prepared to do an interesting job for rather less money than a dull one; are they just a mad minority? These are perhaps the sorts of questions that should be activating research workers today.

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FIELD TRAINING IN OCCUPATIONAL PSYCHOLOGY*

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QUITE A LOT HAS BEEN SAID and written about the training of occupational psychologists. But nothing that I could find has dealt specifically with field training. Therefore I offer a personal view of what distinguishes field work from any other activity in occupational psychology, of the kinds of people who should go in for it, of the essentials for training in it, and where and by whom the training might be done. Until these things have been decided we are in no position to consider details of methods and curricula.

In all that follows I shall keep to the definition of training given in James Drever's Dictionary of Psychology as: "Systematic action designed to establish habits, abilities, skills." I shall regard knowledge of the literature, of methodology, of special techniques of field investigation as results of teaching. I shall assume our student in the field to have been taught these things and that his training should be a matter of practising their use.

I suggest that the field is to occupational psychology what the clinic, or in plain Anglo-Saxon, bedside, is to medicine. Diagnosis, treatment and research appear in both and are closely intermingled since diagnosis and treatment are themselves research in miniature. I shall therefore use the medical analogy freely to illustrate the needs of training. My highly personal and biased views about it derive from a brief period at the bedside and twenty-five years in the field.

Frisby (1948) foresaw the future of the occupational psychologist as an adviser, or as one engaged in research; in the light of the intervening twenty years, it looks as if it's time this adviser and researcher did a lot more than he has been doing to protect *people* from the bombardment of social theory on the one hand or the dissections of ergonomics on the other. The field worker we need must have something of the general practitioner about him, able to assess how many and which specialists to call in.

If I now add to James Drever's definition, *field training* becomes: "Systematic action designed to establish the skills, habits and abilities for work in places where the practical problems of occupational psychology are found."

I think there is one *skill* which really distinguishes field work from other kinds of work in occupational psychology. It is the skill in what in

*Based on an address to the Occupational Psychology Section of the British Psychological Society, 7 January 1968; reprinted from *Occup. Psychol.*, 1968, 42, 209-214.

other fields is known as case study. This is the art of looking all round a problem and bringing to bear on its solution all the knowledge the investigator may have gathered from his teachers or acquired from his personal experience. This will develop the *habit* of mistrust of theory—not denial, but habitual *mistrust* and the realization that practice in real life rests only on assumptions. In Samuel Butler's words, "Life is the art of reaching sufficient conclusions from insufficient premises." This skill and habit will in time produce *ability* in judgement. I find these the essential skills, habits and abilities of field work.

I do not claim they are the only skills, habits and abilities the field worker must acquire. But I do claim that the other requirements of the field worker's repertory belong equally to other activities in occupational psychology.

Support for these views can be found in Clifford Allbutt's famous introduction to his system of medicine written at the end of the last century. Medicine at that time was already considerably more advanced than is occupational psychology today. In referring to prognosis, the prediction of the outcome of disease in individual cases, he makes a point of some importance both to science as applied to practice, and to the training of practitioners. "The observer," he says, "may rely more upon his note-books, and make a calculation dependent on their fullness and accuracy; or he may rely rather upon an acquired instinct bred of accumulative impressions upon his senses, and dependent upon the tenacity of his memory and the quickness of his observing faculties: still, in either case—whether the judgement be more automatic or less automatic—it is based in the last analysis upon statistics . . ." "Again," he goes on, "this acquired judgement does not wholly die with the individual. The instructed observer formulates certain middle axioms which he illustrates at the bedside before his pupils; using these with discrimination, his pupils revise, confirm or modify them; and thus something like a body of quasi-statistical knowledge is handed down from generation to generation."

Perhaps this helps to put the matter in proportion. Making good sense of field research and practice is an infinitely lengthy process in which we do not expect definitive answers to our questions so much as hope for gradually improving approximations. This may be important in choosing field workers, since people who need definitive answers to their questions are likely to be dissatisfied, or to restrict their work to the questions they believe may have an answer. The field worker that I have in mind is the kind of person who is prepared to try and tackle whatever problem he is set to the best of his ability.

Allbutt has a further passage bearing on this question. "The 'merely scientific physician'," he says, "is apt to be blind to useful manoeuvres which rest rather upon the accidental than upon the more permanent qualities of things: indeed, the practical man often sees more of the surface of things than does the analytical man and thus keeps more of a sense of proportion, more of the sense called 'common'. So it comes about that in practice personal tact and character are as important to the operations of a physician as scientific equipment . . . The practical physician does not fail to perceive . . . that the observations of any one person, however profound . . . need some tempering by traditional lore—by the embodied opinions of a vast number

of observers over a long period of time: opinions which, individually inaccurate as they may be, yet make collectively an approximation to truth of no small value to the man . . . who has usually to act on a choice of second best courses."

If I have made fair use of this medical analogy, it looks as if the person we select for training in field work is someone with tact and common sense, who is not afraid of acting on a choice of second best courses and who is not alarmed at a type of work where answers can never be exact. We then have to train him in case study, in the habitual mistrust of theory, and in judgement.

He will also need to develop the secondary skills, habits and abilities of good manners, acceptability, adaptability, of understanding and being understood, of strategy and how to pick up the bricks he will from time to time inevitably drop. But I regard these things as secondary just as I regard the establishment of rapport at a selection interview, or the avoidance of leading questions, and keeping the telephone at bay, as secondary to the question we should ask ourselves: "How much do I know about this person?"

The professional *trained* shorthand typists at a voluntary organization where I once worked always managed to get the facts I wanted about the children we were placing in employment and in about ten minutes flat. The well-taught but untrained voluntary helpers from expensive schools and universities established the most beautiful rapport at interviews lasting forty minutes but seldom knew the children's ages when they'd finished.

Measurement in field work and the description that should underlie it form a useful starting point to illustrate the importance of case study. For example, it is all too easy when using production rates for comparing individual performance to assume a similarity in the jobs that people do which may be quite unwarranted. Both the direct effects of small differences in the jobs performed and the indirect effects of small differences in other associated things like bonus systems, size and form of working groups or style of supervision, as well as the physical environment, can in their accumulation affect performance very greatly. Identifying the factors likely to affect performance as a first step to taking them into account, or to admitting that you can't, is part of that look all round a problem which I have chosen to call case study.

Description of the work needs equal care. For example, occupations have long been classified for accident statistics according to *a priori* assumptions about their similarities. It is not until you study the jobs directly for the purposes of accident prevention that you find how obviously misleading this can be. There can be as much difference, for example, between jobs done on capstan lathes in the risk of injury to the operator as, say, between assembly work and capstan operations as a whole. If statistics are to be used for the purposes of accident prevention, classes must be made from descriptions based on direct observations of the work made specially for that purpose.

We can move on to broader issues of research by way of an edifying story of one study which set out to argue the hypothesis that coalminers'

morale was chiefly the result of historical and social factors. Two coal mines, said to be contrasted in their records of strikes, absence, labour turnover and general reputation were visited by sociologists who asked questions of the miners at the coal faces on which they were working underground. In the report which followed it looked as though the records of absence, strikes and so forth had not been critically examined; and the investigators said they had accepted the assurances of colliery officials that geological and environmental conditions did not differ in ways likely to matter to the research.

But colleagues of mine were working in the collieries at the time, checking the records and measuring the physical environments. They had sufficient evidence to show that the different rates of striking, leaving, staying away from work and other signs of what is called morale might equally be explained in terms of differences in physical environment and in the amount and effort of the work the miners did. Failure on the part of the first group of researchers to look all round the problem had led to conclusions for which there was insufficient evidence.

The same example helps to illustrate my second essential of field work—habitual mistrust of theory, and even the third, the need for informed judgement, if only to know in such cases how many stones must be turned over or avenues explored, and how thoroughly, for conclusions to be reasonably acceptable. (It also showed how actively suspicious a field worker must be. The first group of researchers not only had believed what they had been told about the records and conditions, and I am sure they had been told it in good faith, but somehow they had not been told by managers, union officials or the men themselves that my two colleagues, black as any miner, were at work on one of the coal faces visited, and were delighted to have been included in the sample.)

My final example to show the need to look all round a problem in field work has to do with treatment. It also helps to introduce my simple view on training. During the last war I was given an assignment to examine a Board Interview Procedure used for deciding the disposal of people who had failed in aircraft training. The unit was unhappy, dealing as it did with failures, a few of whom had been given that distasteful label 'lack of moral fibre', and staffed by officers who felt themselves forgotten in an unproductive backwater. The Board interviewing showed all the usual faults of over formality, of competition between Board members in asking crafty questions, and of repressing rather than drawing out the facts.

It was the administrative officer who controlled the mechanics of the procedure who turned out to have the answer. He was a solicitor in private life and had already noticed that half the cases were tied up so closely by red tape that no interview of any kind could alter the disposal. We checked on a large sample and found the proportion to be 51 per cent.

We broke the Boards up in the mornings and allotted subjects to each of the two Board members to see privately. We made them complete a case note record containing the facts they had elicited as well as their recommendations for disposal. The red tape subjects signed their satisfaction that the deal was fair. The Board presidents took responsibility and countersigned

the case note, sending for the subject if they had any doubt. All subjects whose cases were not governed by red tape and those whose disposal remained in doubt were seen by a full Board in the afternoon.

The results were dramatic. With no loss in the total rate of flow, no subject had less time spent on him than before and all had the sympathetic hearing of a private interview. The problem cases had twice the time spent on them by having the Board interview as well and this had now changed completely. The officer who had seen the subject privately became his advocate at the Board; he seemed unable to avoid this role when presenting with some pride the facts he had managed to elicit. The Board members now found the work interesting and worthwhile. The presidents, jealous of their members' more interesting work, took special care to scrutinize the case notes and were certain to complain if there were too few facts. They thus became effective interview instructors. All staff felt they were now dealing with people much more realistically, and the people felt they were treated like people too.

One of the several morals in this tale is that none of the published research on interviewing at that time had any bearing on this real practical problem. The key to it was provided by an officer with no part in the interviewing whose *legal* background showed how a new *procedure* could allow good interviewing to begin?

Another moral is that the new procedure resembled the training used in teaching hospitals which rests upon the student's case notes. It is the pertinence and range of the observations he records and the way in which they point to diagnosis which form the framework of his bedside training. It is on this that he is judged and criticized by the physician responsible for the patient as well as for the student's training—not on the diagnosis which he may try to make as well. Moreover, the process continues throughout the physician's working life. If he refers a patient to a specialist, it is his case notes that he includes in his report; he may or may not give his attempted diagnosis. In consultation the specialist shows the observations that were missed as much as he discusses their significance.

In medicine there is a convention of systematic examination which simplifies this process and this is something which occupational psychology has not yet got. It is a main part of my argument that nothing is more important in field training in occupational psychology than the development of such a system. Equally, it is only through taking field training seriously that a useful system is likely to be evolved at all.

Until we have a system of case study, and in order to help develop it, I would give pride of place in training simply to the writing of reports. If a man can tell me clearly and in the fewest words what was the problem he set out to solve, how he went about it and what he found—in other words present his case study—I can make a reasonable assessment of his work and discuss omissions and their possible significance. Thus there would be the framework of a tutorial system in which people learn by doing, and get knowledge of results on which to correct mistakes and so develop skills; and learning would be a continuous process.

Making reporting the essence of field training is also being realistic. For the report is the field investigator's product. It is the thing he has to sell.

This plea for giving pride of place to reporting in training for field work rests on the further reason that it is not taught at universities. The transfer from reporting laboratory experiments or from discussing other people's writings, to trying to reduce the chaos of field data to some clear form seems to cause enormous difficulty. I do not think it can be taught in undergraduate training except in those few departments which undertake field studies.

For the rest, if our student is not socially inept, if we accompany his first steps in the field and occasionally thereafter, and if we give continual support, he should do well enough. Moreover, the style in which he goes about his work is so personal a matter that overmuch protection, advice or interference may remove confidence and actively prevent development. Many colleagues have shown how well they swam when thrown into deep water.

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STUDYING PEOPLE AT WORK: OUTLINE OF A SYSTEM

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INTRODUCTION

OCCUPATIONAL PSYCHOLOGISTS and others seeking explanation of people's behaviour at work face three methodological problems. The first is to identify and take account of the factors which can affect people's behaviour; the second is to identify and take account of the aspects of behaviour which the factors may affect; the third is to examine relationships between behaviour and the factors which affect it while taking into account their inter-relationships.

Factors affecting behaviour may be situational (such as features of the organization, its management, the work, hours and pay, personnel procedures) or they may be personal (such as physiological and psychological attributes and needs including age, sex and intelligence). The range of situational factors that can affect behaviour has been apparent at least since the early American work of Taylor (1911) and Mayo (1933) and British work of the Health of Munition Workers' Committee, established during World War I. Yet in spite of these classical studies and the comments of occupational psychologists such as Frisby (1948) and Hearnshaw (1942, 1949), situational factors seldom get the attention that they merit. For example, researchers working on the hypothesis that coalminers' morale was chiefly the result of historical and social factors studied two mines with contrasting records of strikes, absence, labour turnover and general reputation; they accepted official assurances that the geographical and environmental conditions in the mines were similar. Yet a simultaneous study in the same two mines revealed differences in the physical environment and in the amount and effort of the work the miners did which could equally well explain the differences in the miners' behaviour (Buzzard 1968).

A second illustration of the need to pay proper attention to situational factors comes from a recent study of labour turnover in an engineering factory (NIIP 1968a). Managers told us that the men wanted to 'get out of engineering' because of a spate of local redundancies in the industry. But factory personnel records showed turnover to be far higher in some departments than in others and men in departments with high turnover expressed particular concern about pay—as a result of recent job evaluation their work was paid at the lowest rates; further there were no opportunities for overtime.

The men repeatedly told us that people left for more money and asked how we would manage on £13 or £14 per week. None of them expressed any fears of redundancy.

Behaviour is also affected by individual characteristics; Taylor (1947) recognized this when he chose a 'high-priced' man for his pig-iron study at the Bethlehem Steel Works rather than someone less likely to respond to the incentive of payment by results. But again researchers and others sometimes fail to take proper account of even such factors as age, sex and length of service. For instance, in a recent report the job performance of a group of older people was shown to be superior to that of their younger colleagues and the author recommended that older people should in future be recruited for that kind of work. But no attempt had been made to equate the job experience of the older and younger people and it seemed likely that superior performance (of the older people) was due to experience of the work rather than to age. If this were so there would have been no advantage in recruiting older people.

Many different aspects of behaviour can be affected by situational factors and by individual characteristics, and it is important to take these different aspects into account. For example, when validating selection tests for punch operators we found at one establishment that operators with high test scores tended to complete training before those whose scores were low. But the operators with high scores also left the establishment sooner than the others and described punching as boring and monotonous.

Establishing a relationship between behaviour and what affects it is often complicated because one aspect of behaviour can itself alter others as well as being affected by other things. For instance, the number of hours that people work can affect their production, attendance, time-keeping and so forth and are thus a cause of changes in them, while hours worked are themselves affected by factors such as low morale or poor job satisfaction which may lead people to do less work. In such ways the inter-relationships between causes of behaviour and changes in it can become extremely complex.

The three methodological problems of identifying and taking account of factors that may influence behaviour, identifying and taking account of behaviour that may be influenced, and examining the relationships between them have for some years been subjects of research at NIIP. This paper describes one product of the research: a system of study to help identify factors influencing behaviour and behaviour influenced by them. It also refers to ways in which information may be collected.

Origins of the System

The system is primarily based on work carried out by the staffs of NIIP and of the Medical Research Council. From its earliest days Institute work has been concerned with what is now called method study; its first published report gave examples of job analysis (Earle 1926) and in the nineteen fifties it produced a paper called *Studying Work* (Reeves *et al.* 1951). Simultaneously it was beginning to develop an outline for recording and studying the mass of

information obtained by its staff in the course of their practical investigations in industry.

Also in the nineteen fifties an MRC team was investigating coal-miners' absence from work; it was decided to study everything that could affect work behaviour in any way so as to ensure that consequent recommendations would not improve attendance at the cost of deterioration in other aspects of behaviour reflected for example in production or industrial relations. Information collected at each colliery included type of neighbourhood, labour supply, history, customs and the policy adopted towards poor attenders. Other factors included size of collieries and working groups, outside attractions and local customs, benefits from sickness and injury, wage rates and earnings, management, supervision and morale; fourteen factors were taken into account when studying effort of work alone. Thus the range of factors and the number identified were exceptional (Buzzard and Liddell 1963).

These hitherto independent approaches were drawn together when in 1961 the director of the MRC team became research director at NIIP. Since that time Institute staff have carried out some hundred and fifty studies of real problems in industrial companies, the design of the studies being influenced by the developing system of case study while at the same time the information gathered was being used to develop the system further. Most of the studies remain confidential to the organizations which commissioned them, but reports of some of the larger ones have been published and illustrate the range of factors that have been taken into account (Johnston 1964, Warne 1966, Keohane 1969). Jennifer Keohane's report on keyboard operating in the printing industry gives particularly clear illustrations of the importance of the three methodological problems outlined above. For instance, aptitude test scores and keyboard performance were both found to be related to other things such as training and previous experience, and failure to identify these relationships could have led to unjustified recommendations about the use of tests.

The System

We have endeavoured to include in this case study system as many as possible of the relevant, independent and assessable factors which bear on general problems such as labour turnover. More elaborate systems are possible in the form, for example, of a programmed text (Easterby 1967); and special checklists have been developed for particular areas such as ergonomics (Shackel and Whitfield 1969), particular kinds of work such as punching (Toplis 1968), and particular circumstances (Cox 1953, Dodds 1968). In its present form the system to be described is akin to the Seven Point Plan commonly used in vocational guidance and personnel selection in being a 'short list of "influences" . . . which . . . we shall neglect at our peril, because thorough enquiry has shown them to be generally important' (Rodger 1952).

It is possible that the classification of topics on the present list may in time be modified; any listing of factors has the disadvantage of drawing

attention to some relationships between factors (e.g. hours worked and pay) at the expense of others (e.g. hours worked and fatigue) which may be equally important. The present classification of factors which can affect behaviour is based on the ways in which information can normally be collected; thus most observations can be recorded under one of the main headings while much of the information that a personnel manager can provide may be recorded under another.

The complete outline is given at the end of this paper. Topics fall under four main headings:

1. Situational factors affecting behaviour
2. Individual characteristics affecting behaviour
3. Behaviour: measures and criteria
4. Collecting information.

1. SITUATIONAL FACTORS AFFECTING BEHAVIOUR

Discussions of the effects of situational factors on work behaviour often emphasize some factors and neglect others thus suggesting that certain factors are predominant. It is more likely that their relative importance will vary from place to place as is shown in attitude surveys (Blain 1955), in studies of satisfaction and dissatisfaction (Herzberg *et al.* 1957), and in studies using the critical incident technique (Flanagan 1954) and the approach which Rodger (1945) later called difficulties and distastes.

Situational factors affecting behaviour at work are listed under five headings. These are:

- (a) The organization and its environment
- (b) Management, supervision, trades unions
- (c) The work and immediate work environment
- (d) Hours and pay
- (e) Personnel and personnel procedures.

These five headings are now discussed in turn.

(a) *The Organization and its Environment*

Features of an organization such as the nature of its business, its aims and objectives, its commercial relationships and its geographical and social environment can influence the behaviour of its employees. For instance, it may be difficult to recruit staff for companies whose business involves processes distasteful to potential employees, such as the slaughter of animals, the manufacture of armaments or the bulk manufacture of pharmaceuticals or cosmetics. The recruitment and retention of staff may also be affected when trade is seasonal as in the building, food processing and catering industries; there may be special difficulties in retaining staff when work is slack, while at busy times the shortage of staff may necessitate the recruitment of casual labour and people with unsettled job records. Work in other industries, for example, aerospace, can also fluctuate but in less predictable ways. Some companies are greatly affected by movements in the price of raw

materials; these movements can lead to fears of redundancy and the introduction of restrictive practices as profits fall and other companies develop and market substitute materials.

The aims and objectives of an organization may be of particular importance. Not only can lack of clarity about them lead to problems of direction and control, but the aims can influence the kind of people who will accept the work or its conditions. For example, employees may be willing to accept poor working conditions and low pay in charities or other organizations with non-commercial aims. Indeed in some organizations the denial of worldly goods is all-important and satisfaction may be dependent on it.

Ways in which the geographical environment of the organization can matter include, for example, the effects on staff of poor bus services or a lack of shopping facilities at isolated sites. The effects may include friction over timekeeping and attendance or difficulties in the change-over between shifts of people doing continuous process work when bad weather makes the relieving shift late or prevents it from arriving. Local customs and traditions sometimes lead to difficulties when companies move into development areas and find that their senior managers from other parts of the country are being treated like foreign invaders. In such cases the effects may be felt not only by the managers but by their wives and families too. Even the layout of a site can cause problems; people in chemical and heavy industries, for instance, may have to walk considerable distances in all weathers to get refreshments and, when at work, may be completely isolated.

(b) Management, Supervision, Trades Unions

Attention needs to be paid to management, supervision and trades unions not only because of the effects that they and their policies and procedures can have on people at work but also because problems such as friction within and between them can seriously affect the smooth running of the organization.

Effects of the Board and top management on employees will vary between organizations; for instance, comments from attitude surveys suggest that employees want to be in touch with the people they know to be making decisions and tend to complain if top executives make decisions from a remote head office without looking at things at first hand. A highly centralized organization may be stimulating, or even challenging, for people at its centre but extremely frustrating for people at the periphery who are left with only routine work and decisions. Again, managers who report to more than one superior may feel less effective in their work than people who report to one superior only (Blain 1964). The effectiveness of administration can be important; employees feel strongly about being kept waiting for work or being unable to get adequate tools and equipment (Blain 1955; Cox *et al.* 1953).

The democratic structure of trades unions is such that account needs to be taken of attitudes and policies at site, local and national level because there may well be unofficial differences between them.

(c) *The Work and Immediate Work Environment*

The classic studies of the Health of Munition Workers' Committee and of the subsequent government boards (Industrial Fatigue, later Health, Research Board) and other research groups, show clearly the importance of factors associated with the work, e.g. layout, and with the immediate work environment, e.g. temperature, light, noise. Indeed, it is difficult to see how any worthwhile study of people at work can be carried out without taking such factors into account. But observation of the work and its immediate environment has often been superficial and differences in the actual work done may have escaped attention. For instance, accidents can result from people working on different kinds of equipment designed to perform the same function so that a 'correct' action on one may be 'incorrect' on another (Powell *et al.* 1971). Sharp edges left on components can cause accidents; further, if these components are handled by only a few operators, these operators may be thought 'accident prone'.

Differences either in the work itself or in the working conditions can sometimes account for dramatic drops in performance when new workers leave a training room and start production; for instance, end-of-course assessments of performance in some keyboard training are based on exercises which have been practised daily throughout it but which take no account of the more varied tasks of production departments; further, the keyboards on which training is given may have different layout of keys from those used for production work so that movements well drilled during training later cause errors. The importance of social factors must not be underestimated. For instance, one company's move to premises which were superior in heating, lighting, ventilation and so on was resented by employees because established social groups were broken up. Similarly, canteens are rarely filled to capacity; if people cannot sit with their friends some would rather miss a meal or eat sandwiches than eat a canteen meal next to strangers.

(d) *Hours and Pay*

Hours worked have direct effects on many people's pay; not only is the number of hours worked important, particularly if overtime is paid at higher wage rates, but the time at which they are worked can also matter because of shift allowances. Both of these can have other effects as well. Long hours can lead to fatigue, contribute to accidents and curtail domestic and social life which may also be adversely affected by shift-working. There is evidence that absence increases as hours worked increase (Buzzard and Liddell 1963, Martin 1971). There are also indications that shift-work has adverse effects on some people, upsetting their digestion and making it difficult for them to get adequate sleep. However, these side effects seem to depend to a considerable extent on individual characteristics, and there are some people who prefer unusual hours and shift-working (Sergean 1971).

Shift workers may face other problems; public transport may be poor or non-existent early and late when shifts change, while amenities for shift workers, such as canteens, are often inferior to those provided for day workers. Further, shift workers may be unable to make regular use of social

and recreational facilities and may have to return to their place of work during the daytime to see senior management.

Payment by results is common in industry although there is little evidence to support it (Behrend 1957). It gives people the opportunity to earn more and can give a freedom from supervision, but research studies among particular groups have shown a lack of enthusiasm for it; for instance, Davis (1948) found a majority of operatives opposed to incentive schemes, Mahoney (1964) found managers prefer straight salary to various types of incentive payment and the National Board for Prices and Incomes (1968) stated that advantages of payments by results are widely offset by the sense of insecurity arising from fluctuations in earnings. On the other hand Wyatt and Marriott (1956) reported more approval than disapproval of group incentives, and other evidence suggests that the acceptability of particular schemes may well depend on particular circumstances (Lupton and Gowler 1970). For instance, there are sometimes misunderstandings about PBR schemes, employees believing that bonus should reflect their effort rather than their output and complaining when colleagues earn bonus with apparently greater ease than themselves. Further, it is not uncommon to find that PBR schemes are applied inappropriately; for example, setters may adjust machines to run at different speeds which can affect output more than does the operator's rate of working. In one organization we even found that inspectors were paid on the number of products that they passed—this encouraged them to pass faulty products as they were paid less if they rejected them (NIIP 1968b).

(e) Personnel and Personnel Procedures

Both rapid growth of an organization and redundancies in it can be unsettling and even stressful for employees; so too can internal re-organizations such as the replacement of traditional accounting by modern methods using a computer, a punch room and the attendant specialist staff. Changes in the numbers and kinds of people employed need to be allowed for when personnel procedures are being designed and reviewed; for instance, recruitment and assessment procedures for professional and technical staff are unlikely to be suitable for hourly-paid employees.

The need for an integrated system of personnel procedures was illustrated in one study of high labour turnover where no contact existed between people responsible respectively for selection, training, welfare and terminal interviews; consequently each blamed the others for the turnover and remained oblivious to ways in which his own part of the procedure might be improved (NIIP 1970). To accept what we were told by one department without discovering what the others said would have resulted in a false description of the situation. Again, personnel procedures may have no more than face validity; for instance, many people interviewing for selection have not been trained, tests and procedures are seldom proven in particular situations, appraisal and development interviews may not be taking place although the appropriate forms are being completed, and so on.

Most people attach importance to the security of their jobs and wish to know where they stand, particularly in times of crisis; this is contrary

to the policy of some organizations to protect their employees until the last possible moment from information about such matters as redundancy. Inevitable rumours make the delay stressful and can cause bad feeling (Buzzard 1966).

2. INDIVIDUAL CHARACTERISTICS AFFECTING BEHAVIOUR

Individual characteristics include people's physiological and psychological attributes and needs. Individuals can also be described in terms of their appearance and their biographical characteristics; such characteristics may be important in themselves (e.g. extremes of height and weight may be handicaps where the working space is limited or machine controls unalterable) and can be assessed with a minimum of knowledge and training. Indeed, it is through people's appearance and behaviour that the more basic physiological and psychological characteristics are often revealed and assessed.

Certain kinds of experimental study demand that particular attention be paid to individual characteristics. For instance, if two alternative methods of training are to be compared it is important the people undergoing each one should be similar in respect of relevant characteristics, such as intelligence or previous experience, otherwise differences in results of training may reflect differences between the groups rather than differences in the effectiveness of the two methods. These kinds of differences can explain why an apparent improvement in working conditions may be followed by a fall in average output—if experienced and competent staff left at the time changes were made and were replaced by trainees, the fall in average output may in fact have coincided with improvement in most individual output figures.

(a) *Physiological Attributes*

Physiological attributes such as physique and health are considered to be of primary importance in some occupations; people such as aircraft pilots and service personnel undergo stringent medical examinations both at the time of engagement and at intervals thereafter. Examinations may focus on selected attributes which are thought to be essential in particular circumstances, such as normal colour vision for certain kinds of printing, and clear speech and a pleasing voice for telephone work. Age may be important; for instance, performance at heavy work tends to decline after middle age, and age may influence the kind of training that is appropriate (Belbin 1964; Welford 1958). There is evidence too that as people grow older they behave more rigidly (Pym 1965).

(b) *Physiological Needs*

People need adequate air, food, warmth, rest and elimination, and their deprivation may affect performance at work. Their importance is obvious when work is arduous, or in extremes of temperature or for very long hours, but even then insufficient provision may have been made; for example, the performance of naval ratings on a vigilance task in arctic conditions deteriorated during a watch as short as half an hour in spite of wearing standard protective clothing (Poulton *et al.* 1965). It is less evident when apparently

undemanding work entails long or inconvenient travel, or times for leisure that are at odds with normal domestic arrangements. Performance may often be maintained by the adequate provision of rest pauses, food and drink and protective clothing but what is adequate will depend on particular circumstances.

(c) Psychological Attributes

Psychological attributes include intelligence and special aptitudes, experience and personality. Intelligence has proved to be a predictor of performance in a wide range of occupations; in one study it was found to be related to attitudes of young men towards work sought and incentives thought worth working for (Wilkins 1949). Intelligence has been related to labour turnover and job performance (Hakkinen and Toivainen 1960); so also have special aptitudes as measured, for example, by tests of mechanical comprehension (Frisby *et al.* 1959). Experience can be a major factor in determining job performance, not only when highly technical work (peculiar to a single industry or organization) is at issue, but also at more mundane levels; for instance, studies of keyboard work have shown that experience of a similar keyboard may be the best single predictor of initial job performance (Keohane 1969). Relationships between aspects of personality and aspects of behaviour at work have been shown for various occupations such as systems analysts (Crawley and Morris 1970) and salesmen (Mayer and Greenberg 1964).

(d) Psychological Needs

Studies of practical complaints and suggestions at work (Blain 1955) are in broad agreement with results from more theoretical work (Herzberg 1968; Maslow 1970): most people seem to look for self fulfilment (Heller and Porter 1966), for recognition, for esteem, love and affection, for some security in personal and occupational relationships, and for opportunity to approach and achieve whatever objectives they have set themselves. Sometimes these needs conflict; people have been known reluctantly to leave otherwise satisfying work because of uncertainty over their future prospects when they had in fact been marked out for advancement but not told; conversely they will sometimes remain in trying circumstances if to do so contributes to some personal objective such as a technical qualification or a desire to be useful. Performance at work is likely to be influenced by whether work circumstances permit or prevent the fulfilment of underlying needs (McGregor 1960).

(e) Biographical Characteristics

Biographical data constitute another set of variables that may relate to behaviour. People may be grouped according to the different kinds of secondary school they attended, whether they passed examinations or not, whether they have professional qualifications and so on. Comparisons of the biographical characteristics of people whose performance is adequate with those of others who are unsatisfactory may show differences that can be used as predictors, as well as explanations, of work behaviour.

3. BEHAVIOUR: MEASURES AND CRITERIA

For the purposes of some investigations it may be sufficient to find out whether or not certain kinds of behaviour have occurred, e.g. strikes or fatal accidents. But in most studies of people at work there is need for measurement of behaviour by reference to indices such as output, timekeeping, absence and labour turnover; sometimes choices both of measures and of standards (or criteria) are needed.

Aspects of behaviour to be studied are sometimes specified in advance; for example, executives of an organization may want labour turnover cut, or a research worker may wish to prove a theoretical point relating to one particular aspect. But too close restriction of what is to be studied can have serious practical and theoretical consequences. For example, turnover might be reduced but at the cost of higher wages, or 'peace' in industrial relations bought with agreements for higher wages and shorter hours but without guarantee of higher productivity; unless all these aspects of behaviour are measured, important side effects may be overlooked.

Not only should several measures of behaviour be examined, but their true meaning needs careful scrutiny as well. For example, a recorded accident rate may fall because it has somehow become more difficult to report accidents or rise because there is increased incentive to report; the true incidence of accidents may have remained unchanged. Alternatively they may indeed have fallen because working methods have been changed. Similarly, absence may have fallen because the official hours worked have been reduced rather than because of other changes which were believed to have caused the effect. Output figures can be misleading too as in one factory where production figures sent to Head Office showed that output was rising steadily; but, in fact, products were counted before inspection and those found faulty during inspection were repaired and put back on the production line; in this way output figures rose whenever quality dropped.

When investigations are carried out with particular aims, such as reducing labour turnover or increasing production by specified amounts, the choice of standards is as important as the measures used if the standards are to be realistic and not set at levels which could have untoward effects. For example, labour turnover can be too low for a company's wellbeing; an unrealistic reduction in turnover may not be possible to achieve without paying high wages to retain unsuitable or frustrated staff; an organization which asks for too high qualifications in the people it recruits may have too few applicants because people with such qualifications are in too short supply.

4. COLLECTING INFORMATION: SOURCES AND METHODS

It is clear from the range of behaviour open to study and of the situational factors and individual characteristics which can affect it that much information needs to be collected and taken into account if the soundness of research or advice is to be ensured. In practice it is unlikely that all the information needed will be immediately available or that it will be found at a single

source; instead it is more likely that information will have to be collected from a variety of sources and that circumstances such as lack of time or money will cause omissions. However, economies can be effected by a systematic approach, and the outline that we give shows possible sources of information and ways in which it can be collected. The following discussion concerns the examination of existing records, the introduction of special records and the direct collection of information by means of interviews, questionnaires, observations and measurements.

(a) Records and Documents

Existing records that may be available are listed. They include statements about the organization (such as annual reports and accounts), about management (such as organization charts), about the work done (such as machinery specifications), about hours and pay (such as clock cards and time sheets), about personnel and personnel procedures (such as analyses of numbers employed and copies of agreements). Personnel records may also include information about the physiological and psychological attributes of employees and their biographical characteristics, while psychological needs may occasionally be revealed on assessment forms if a well-designed scheme is operating successfully.

Practical problems in industrial and other organizations often first come to light through existing records, and a preliminary check should be made to ensure that the problem is not an artifact of the way that the records are kept. For instance, a study of labour turnover was carried out in one company because management noticed that more girls were leaving than in previous months. But neither management nor the consultants making the study took account of the fact that recruitment had also increased to fill new vacancies caused by expansion, and subsequent investigation showed that when the increase in recruitment was taken into account the rate of turnover had remained unchanged. Another example comes from a study in which psychological test scores of apprentices were compared with examination performance; no relationship was found and it was, therefore, said that the tests were not effective; but in fact test scores had played a major part in determining the selection of the apprentices in the first place and all their scores were high; the tests could well have been identifying the people who had, correctly, been rejected.

Once it has been established that a real problem does exist, records can sometimes suggest how an investigation might proceed. For example, labour turnover may be recorded as higher on some shifts than on others, but again care is needed before drawing conclusions because personnel records often lack both accuracy and completeness (Buzzard and Radforth 1964).

As well as assisting in the identification and definition of problems, records can sometimes be used as an aid to their solution. Studies of personnel records, for example, may show that certain biographical information or other characteristics assessable at the time of recruitment are related to performance, length of service and so on; thus they may serve as predictors.

However, here again, it is important that analyses should be both accurate and technically sound. For instance, at one factory it was noticed that among a group of girls who had recently left were a large proportion who had had previous experience in shops or offices, while those with previous experience of factory work were in the minority. But no account had been taken of the spread of experience among the girls in employment. When turnover rates were calculated separately for girls with shop, office and factory experience, no differences were found. The first set of results had merely shown the characteristics of the girls who happened to be leaving at the time of the study.

Special records may need to be introduced if existing ones are inadequate either through lack of accuracy or because insufficient measures of behaviour are available. It is always advisable to carry out pilot studies on drafts of forms or questionnaires to ensure that items are understood and that the information is being recorded accurately and in a manner suited to subsequent analysis.

(b) Interviewing

Interviewing is the basic and most flexible means of collecting information directly. To obtain true and complete information confidence must be established between the interviewer and the interviewee; this can be aided by ensuring that the interviewee knows and approves the purpose of the interview, that he is encouraged to do most of the talking and that he gets an attentive hearing. It is often wise to let interviewees know in advance why the interview is wanted, so that they have time to collect their thoughts; and, of course, the interviewer should be well briefed and prepared. Establishment of rapport is likely to be hindered by interruptions, criticism or expressions of disagreement.

Employees' views and opinions about matters related to work are not only of interest, they are important facts of a particular kind; but equally or more important may be their accounts of why these views came to be held. Thus to report that supervisors had insufficient written information about policies in order to do their jobs properly is more useful than merely stating that they had expressed dissatisfaction with communications.

Most people tend to remember only what they want to. Notes should, therefore, be taken of all that is said at interviews whenever this can be done without impairing rapport. Indeed, a check should be made that technical information and other points on which there could be misunderstandings have been noted correctly.

Interviews can incorporate established survey techniques. If no questions are asked but people are simply encouraged to talk about matters affecting them at work, the frequency and force with which topics are mentioned can be taken as a guide to their importance in the employees' eyes (Raphael 1944). Alternatives include focused interviews where people are encouraged to think about topics one at a time, and structured interviews where specific questions are asked of each person.

(c) Observation

Observation is essential; no record system can ever record all that is happening in an organization, and people interviewed may fail to mention things which could be important or may even have failed to notice them in the first place; for instance, they may not notice hazards or they may be prepared to endure extremes of temperature which could adversely affect performance and increase the risk of accidents. Besides, they may fail to mention these sorts of things simply because they have come to accept them; this is sometimes the case, for example, with high noise levels which in time can cause deafness; however, although those remaining at work may have become used to such things they may have been primary causes of others leaving.

Observation should not be confined to the work and physical working conditions; some idea of the state of relationships within the organization can be obtained by noticing the way people talk to each other, the way introductions are made, and whether people tend to smile or to scowl. There are occasions too when something can be learnt from graffiti as in one factory where a supervisor's name appeared under a swastika.

Observations can form the basis of crude methods of measurement: a statement that people had to stand close together and shout to make themselves heard gives a description of the prevailing noise level. Various methods of recording observations are, of course, available using work-study techniques, closed circuit television or film, sound recorders and so on.

Apart from its direct value observation can promote the success of an investigation by proving the investigator's readiness to look at things at first hand. It encourages rapport, particularly perhaps, where management is considered remote. It is also a precaution against being misled by exaggeration of adverse features of the work or its environment.

(d) Measurement

Measurements may be of the working environment (heating, lighting, etc.) and of both the physiological and the psychological state of people at work. Measurements, if reliable, are more accurate than judgements, and they enable more rigorous statistical techniques to be used in analysis of the information collected. Further, some measuring devices also produce permanent records (such as tracings on a graph or perforations on paper tape) which can be subjected to more intensive scrutiny than an investigator's impressions and observations.

Measurement of environmental conditions, like observation, can point to problems of which people are unaware—for instance, measurements may show that noise is of a level and kind which may cause deafness or that fluctuations in temperature during the time spent at work are sufficient to have adverse effects on people's behaviour.

Physiological measurements too may reveal dangers of which people are unaware, for example, by showing reactions to high temperatures, fumes and gases, and by showing the demands that effort is making on the heart and respiratory system. Indeed, there are suggestions that in the future

heart-rates and respiratory measurements, though susceptible in some degree to conscious control, might provide a more accurate way of defining a 'fair day's output' than estimates which are at present made by work-study practitioners; such physiological measurements might also be used to establish optimum work speeds and rest breaks.

Psychological measurement requires particular caution because of uncertainty about its reliability and validity. Nevertheless, attitude scaling and other such methods should be attempted rather than set aside on the grounds that they may be inaccurate. Whatever the facts established by more objective and reliable means of measurement, it remains true that people respond to situations and factors as they perceive them.

USE OF THE SYSTEM

In a large-scale investigation it may be possible to collect information under most headings in the outline using a wide range of techniques to do so. Such comprehensiveness is obviously desirable if the hazards posed by the three methodological problems noted at the beginning of this paper are to be avoided.

However, in the practical situation both time and money are likely to be short and in such circumstances the outline is best regarded as an aid to the hypothetico-deductive system which most investigators adopt. For example, the initial stages of an investigation into labour turnover are likely to consist of collecting information about factors commonly associated with it such as the work and working conditions, pay, hours of work, personnel procedures (particularly selection and training) and supervision. If explanation of the turnover can be found in these areas, attention still needs to be given to other points in the system of study to check that nothing important has been missed; however, it would be unreasonable for all these matters to be investigated in depth or with expensive or inconvenient techniques. On the other hand, if initial investigation of factors normally associated with turnover reveals nothing unusual, a choice has to be made between re-examining these factors in more depth (using measurements rather than interviews and observation) or investigating other matters which might be relevant such as the history of labour relations on the site, the aims and objectives of the organization, the organizational structure and so on. At whatever stage likely explanations appear, it is important to try and look at remaining items in the outline in case these too are important.

Interpreting the Information Collected

Examples given have shown that the interpretation of information demands much care. Often a simple tabulation of data about individuals and their behaviour can be more useful than more sophisticated statistical techniques based on group characteristics and performances. Suppose, for example, that a drop in group output has been noticed and that opinions are divided as to whether the cause was a difficult batch of work or the reduction of overtime hours. In such a situation data about the performance of the group do not resolve the problem, but if individual data are available they may well

indicate which view is correct; if the drop in output is due to less overtime being worked all members of the group are likely to have produced less, whereas if a difficult batch of work was the cause, the drop in output is likely to have been confined to the people who were working on it.

Possible Effects of the System

Some twenty years ago H. M. Vernon (1948) wrote, 'During the early stages of World War II it was very disappointing to find that some of the chief lessons learnt during World War I were almost ignored, especially those relating to hours of work and Sunday labour.' Similar comments might be made about the apparent lack of attention to the findings of later research workers—for instance, how many car manufacturers have heeded Walker and Guest's findings (1952) and arranged for people doing monotonous work to change jobs if they so wish? The gap between practice and research may be due in part to the lack of a comprehensive scheme of interrelationships to which managers and research workers alike might refer. Research may have been discredited and advice based on it have yielded disappointing results because findings from one apparently excellent study were not supported in another where the circumstances had differed in subtle ways whose importance was not appreciated. The system outlined in this paper may go some way towards enabling managers and those who advise them to see more clearly the complex interactions between causes of behaviour and behaviour itself; and it may serve to remind research workers of the range of factors which should be taken into account when behaviour at work is being studied.

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OUTLINE OF A SYSTEM FOR STUDYING PEOPLE AT WORK

I. SITUATIONAL FACTORS

(a) The organization and its environment

the organization

- financial control
- commercial relationships
- history (including mergers and take-overs)
- divisions, departments, etc.
- raw materials, components, processes
- markets
- aims, objectives, plans and policies

geographical and social environment

- location of sites
- factors affecting location (water, transport, indigenous materials, development grant, etc.)
- topography of the site(s) (size, entrances and relative positions of the buildings)
- other industries in the area
- catchment areas for employees (level of employment, transport, health, housing and schools)
- local attitudes, customs and traditions

(b) Management, supervision, trade unions

the board, council, etc.

- executive, advisory
- number of management levels

management structure

- use of specialist and service departments
- degree of centralization of control

organizational change and development

management responsibilities

- apparent, e.g. lists of duties, methods of work
- implicit, e.g. responsibility for policy, people, property, whether decisions are short- or long-term, etc.

management facilities and procedures

- production planning and control
- stores
- allocation of people to jobs within departments, mobility
- safety
- maintenance
- quality control and inspection
- waste

trade unions

- name(s) of union(s)
- number of members
- whether recognized by management or not
- agreed procedures
- facilities made available by management
- disputes at site
- union policies at site, locally, nationally

other systems for employee representation

suggestion scheme

communications within and between groups

- upwards, downwards
- between people of the same level
- between people with similar responsibilities

(c) The work and immediate work environment

machines, tools and equipment

design or nature of the product and its components

type of work; objectives and responsibilities (apparent, implicit)

variety of tasks, length of work cycles, speed of working

- physical load
- psychological load (e.g. decision making, vigilance)
- standards
- differences in work methods
- supporting facilities (e.g. internal transport, post)
- existence of records of individual output or other behaviour

- working posture
- site amenities
 - standing, sitting, stooping, walking, etc.
 - car parks
 - changing rooms, toilets, washrooms, showers
 - canteens
 - first aid and medical facilities
 - sports, social and recreational facilities
 - are amenities available to all or are some people precluded, e.g. shift workers?
- physical conditions
 - place of work—office, factory, indoors, outdoors, etc.
 - layout and space
 - lighting—natural and artificial
 - temperature—average, variations
 - humidity
 - dust, gases, smells
 - air movement and ventilation
 - noise and vibration
 - cleanliness
 - state of repair
- social conditions
 - sources of danger and means of protection
 - opportunities for contact with colleagues
 - supervision and employee representatives
 - relationships between individuals
 - between informal groups
 - between sections and departments
 - prevalent attitudes, opinions and rumours

(d) Hours and pay

- duration of work contract—temporary, permanent
- hours of work—full time, part time, shift, flexible, etc.
- overtime, fluctuations in the availability of work
- absence, holidays, etc.
- method of recording hours worked
- pay reviews and negotiations
- pay and salary scales
- method of determining basic rates of pay
- additional payments
 - payment by results
 - overtime and shifts
 - responsibilities
 - danger and dirt money
 - long service awards
 - qualifications
 - increments, bonuses, profit-sharing
- sick and holiday pay,
- the method of distribution of pay
- comparison of pay/hours inside and outside the organization

(e) Personnel and personnel procedures

- number of employees—past, present and expected
- organization of the work force
 - size of departments
 - distribution of age, skill, etc.
- manpower planning
- recruitment, selection and medical examination
- contracts of employment, assistance with removal expenses, etc.
- induction and job training
- allocation
- assessment and grading
- development and counselling
- opportunities for transfer and promotion
- disciplinary procedures
- welfare facilities for present and past employees
- retirement, pensions
- job security, redundancy

2. INDIVIDUAL CHARACTERISTICS

(a) Physiological attributes

age, sex, state of health
height, weight, physique, appearance

(b) Physiological needs

air	food and drink	rest/sleep
water	warmth/clothing	elimination

(c) Psychological attributes

intelligence and special aptitudes
experience
personality

(d) Psychological needs

security
social contact, love, esteem
recognition, responsibility, scope, challenge, advancement, achievement
self-fulfilment

(e) Biographical characteristics

early circumstances, occupation of parents
schools attended, examinations passed
higher education, professional and other qualifications
occupational attainments
interests
circumstances

3. BEHAVIOUR: MEASURES AND CRITERIA

For general use:

discharge of responsibilities
meeting schedules (where discretion is allowed)
quantity and quality of output
relations with others
timekeeping
sickness and absence
accidents
morale
labour turnover
disputes and strikes

For selection add:

acceptable applicants
numbers recruited
comparisons with previous recruiting
end-of-training results (see below)
cost benefits

For training add to general items:

numbers completing training
end-of-training results — assessments from trainer, trainee's manager, trainee
cost benefits

4. COLLECTING INFORMATION: SOURCES AND METHODS

Existing records and documents

- the organization and its environment (re 1a above)
 - annual reports
 - information from trade directories
 - public relations information
 - staff handbooks
 - written statements of aims, objectives, plans and policies
 - books, maps, etc.
 - statistics from local employment exchange, Chamber of Commerce, etc.
- management, supervision, trade unions (re 1b above)
 - annual reports
 - charts of organizational structure
 - job descriptions
 - union statements and policy
 - minutes of meetings
 - company newspaper, house journal, etc.
- work and immediate work environment (re 1c above)
 - manufacturers' literature for machines, tools and equipment
 - technical drawings, specifications, etc.
 - methods study data on tasks, work cycles, etc.
 - records of output, waste, etc.
 - accident and medical records
 - canteen records
- hours and pay (re 1d above)
 - copies of contract of employment
 - clock cards, time sheets, etc.
 - wage and other agreements
 - pay and salary scales
 - pay slips, counterfoils, etc.
 - union/employers' association survey reports
- personnel and personnel procedures (re 1e above)
 - summary tables of numbers employed, etc.
 - application forms
 - interview record sheets
 - test scores
 - medical records
 - training records, course reports, etc.
 - wage and other agreements/staff handbooks
 - turnover statistics
- individual characteristics (see 2 above)
 - personnel records (see above)
- measures of behaviour (see 3 above)
 - assessment and appraisal records
 - clock cards, time sheets, etc.
 - accident records
 - turnover statistics
 - records of disputes and strikes
 - training records

Special records may sometimes need to be developed to supplement or replace any of the above.

Direct collection of information

interviewing, e.g. non-directive, focused, structured
 observation, e.g. of matters listed at 1c above (watch, listen, touch, smell, taste)
 measurement—physical, physiological and psychological

ACCIDENTS IN PERSPECTIVE

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SUMMARY

The paper briefly reviews past accident research, particularly pointing out two areas which have bred misconceptions: accident proneness and unicity. It puts forward a model of the accident process which could provide a more fruitful basis for future work as well as an explanation of past research results.

EVER SINCE the beginning of the century, accidents have been a favourite subject of study and comment in scientific and technical journals, as well as in the popular press. One bibliography (at the Ergonomics Information Analysis Centre, Birmingham University, formerly at Warren Spring Laboratory) lists over five hundred references to work on industrial accidents alone, and the literature on transport accidents is even more voluminous. The references tend to fall into two categories: the first concerned with theoretical considerations of accident causation, research-orientated and usually written by psychologists, sociologists, or statisticians; the second concerned with practical advice on particular aspects of safety in industry, usually of a commonsense nature and confined to particular industries or particular jobs, written by safety officers or engineers.

Between the two approaches to accidents, the theoretical and the practical, there has been a wide gulf with only a minimal traffic of ideas across it. One such idea which has had considerable influence on thinking about safety is the concept of accident proneness.

Accident Proneness

This concept originated in the work of the Industrial Fatigue (later Health) Research Board (Greenwood and Woods 1919; Newbold 1926, 1927). They looked at the pattern of occurrence of accidents in various groups of workers and tried to fit to the figures statistical distributions based on various hypotheses of accident liability. They found that the best fitting distribution was one which they had derived from a hypothesis of unequal personal liability to accidents. This tentative statistical conclusion led other workers to devise tests for accident proneness (e.g. Farmer *et al.* 1933).

The hypothetical nature of the concept was lost sight of in the mass of work which ensued and a number of researchers made the implicit assumption that accident proneness was a stable personality trait. Many different

kinds of tests were tried on groups of people engaged in a wide variety of work, but the reliabilities of most of the tests were found to be disappointingly low, test-retest reliabilities of about 0.4 being usual. Two significant facts, however, emerged from this work. First, the more closely the tests came to testing the skills required for the job, the higher was the correlation between accidents sustained and performance on the tests (Miles and Vincent 1934). Second, the more homogeneous the risks to which the population was exposed, the more predictive were the tests (Biesheuvel and White 1949).

During the 1950s and 1960s, the concept of accident proneness came under strong attack both from the statistical viewpoint and from the point of view of its usefulness. It was shown that the original findings of Greenwood and Newbold could be explained by theories other than that of unequal personal liability to accidents, for example, liability which was altered by the occurrence of an accident. It was also shown that the members of a group who sustained a large number of accidents during one period were not necessarily the same as those who sustained many accidents in a subsequent period (Arbous and Kerrich 1951; Froggatt and Smiley 1964).

This work discredited the idea that accident proneness was a stable trait of personality. It also threw doubt on the use of tests to identify people who are prone to accidents in a wide variety of situations. But it did not kill this meaning of the term and work continued on developing tests to measure general proneness (e.g. Kemp 1967, Kuncze 1967, Meldmann 1966, Noesen 1966, Cattell *et al.* 1970).

Meanwhile, the concept of accident proneness had been adopted by large sections of the population and regarded as proven beyond doubt. People in industry still ask for tests to identify the engineer who, twenty-five years later, will incorrectly operate a complex piece of equipment and blow himself up. The idea of proneness has probably contributed to the tendency to blame the man for an accident rather than the situation into which he is put, a tendency reinforced by the concentration on the legal and insurance aspects of accidents, which require blame to be allocated.

Despite this widely held belief that the cause of accidents lies in a person's carelessness or proneness, the most common safety measures taken after accidents are changes to the machinery or to the environment, such as the provision of guards, or safety clothing, or the introduction of complicated safety rules. Some attempt is made by the use of safety posters and competitions to exhort people or frighten them into safe behaviour, but safety training comes far down in the prevention league. More effort is put into preventing an accident from causing an injury than into preventing the accident from happening.

Unicausal Theories

No one denies that many factors cause accidents, but a large number of research papers consider only one factor or a small group of factors in isolation without taking adequate account of others and indeed often without even considering them. These researchers then tend to accept the evidence from their studies as supporting their hypotheses about causation without

considering other equally plausible explanations. This often arises because they have too uncritically assumed a homogeneity of risk in their populations, for example believing that all people in one job category are exposed to identical risks.

This tendency to overlook some of the possible causative factors is encouraged by the common reliance upon injury records as a source of data about accidents. Most record systems try to force descriptions of accidents into predetermined categories and many of them allow only one cause for each accident, thus putting their own bias on the information.

A MODEL OF ACCIDENT CAUSATION

This paper puts forward a model of accident causation which attempts to overcome the problems outlined above. First, it tries to put the idea of accident proneness in perspective by providing a framework into which all factors contributing to accident causation can be fitted. Second, it draws attention to the fact that every accident has more than one cause and that no one causative factor is implicated in all accidents. Third, it tries to bridge the gulf between the theoretical and the practical approach to accident causation by providing a framework in which ideas from both can be used. Fourth, it tries to get away from the confusion between accident and injury which has troubled so much accident research.

Definition of Accident in Terms of the Model

An accident is defined as the failure of a person to cope with the true situation presented to him. The cause of the failure may lie largely with the person, largely with the situation, or, more usually, with both.

Whether or not the accident produces an injury is a separate consideration from the causation of the accident; for example, a car driver going across a set of red traffic lights at 3 a.m. when there is no other traffic around, would in terms of the model be considered to have had an accident, although it produced no injury; whereas the case of a man deliberately jumping from the tenth floor of an office block to commit suicide would not be regarded as an accident, although it produced a fatal injury. Equally the passengers in a train who are injured when it collides with a heavy lorry at an unmanned level crossing have not had an accident, in the terms of the model. The accident has happened to the train driver and the lorry driver, who may have escaped injury.

Description of the Model

The model is in the form of a closed loop for handling information, with the person as the information channel perceiving, processing and acting upon the situation which is thus changed for his later perception. The man and the situation, both past and present, interact at all stages. Some of the factors involved in the breakdown of function at each of the stages are shown in Figure 1. The process is explained below.

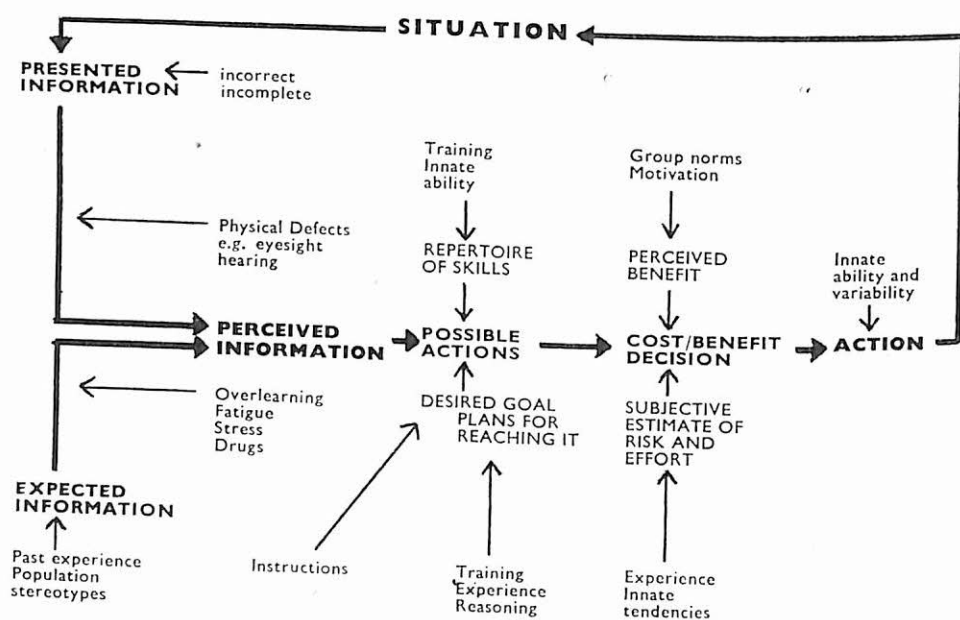
Presented information. Information is presented minute by minute to the person's senses by the situation. If this information is incorrect, for

example, false instrument readings, an error may result. Equally, if the information is not sufficient to enable the person to formulate a correct solution to the situation, and he does not seek further information, an error may occur.

Expected information. It is not only the presented information which gives rise to perception. Everyone in a given situation has his own expectancy about the information with which he will be presented. This expectancy can distort his perception by causing him to overlook aspects of the situation which he does not expect to be there or to 'see' other information which is not in fact present. Such reliance on expectancy rather than on presented information occurs particularly in habitual or over-learned tasks, under conditions of time pressure, and when the person is fatigued or under the influence of certain drugs. For example, a person who walks along the same corridor every day may fail to 'see' that on a particular day it has been given a high polish, and may fall flat on his back; or an assembler coming in to work one morning may brush against a soldering iron which is normally cold at that time, and burn herself, because on this particular occasion it has been left switched on by the night shift.

Figure 1

MODEL OF ACCIDENT CAUSATION



Thus the *perceived information* comes from two sources, the presented information which is external to the person, and the expected information which is internal.

Decisions. At the next stage a decision has to be made on the action to be taken to cope with the situation. Various factors come into play at this time. First, the desired outcome or goal of the process has a bearing, since if the person has been given the wrong instructions about what he should

try to achieve, an error is likely. Again, the individual may have formulated several moves ahead his own plans of action for attaining the goal. If these are inadequate because of faulty reasoning, poor training, or incorrect application of past experience, errors may occur. For example, an engineer may set about dismantling a piece of equipment in the same way as he has done with a dozen others earlier in the week, without realizing that this is a slightly different model with a steel pin held under pressure by the plate he is unscrewing. Consequently, the pin is driven into his face as he bends over to take the last screw out.

Second, a person's repertoire of skills, both physical and mental, acts as a limiting variable at the decision stage. This may be the most important factor which makes the difference between an injury and a near miss, where the person has the skill to avoid the injury in the last few crucial seconds, for example, the driver whose reaction time is short enough to stop before colliding with a bus which pulls out in front of him, compared with the person, perhaps older and less fit, who runs into it.

Third, when the possible actions have been defined, the decision about which one to take can be seen in cost/benefit terms; the cost in effort required and the subjective estimate of risk being weighed against the benefit in terms of estimated size and type of reward. For example, an operator deciding whether to allow the chuck on a lathe to stop rotating before removing the component weighs the risk of catching a finger nail in the chuck and losing the finger, or of being lacerated on a sharp revolving edge, against the time and bonus he would lose by waiting. The degree of risk which will be run for a given reward will vary from person to person, and from time to time; so will the accuracy with which a person estimates the risk and the amount of knowledge upon which he can base the estimate.

At the final stage of carrying out the action, there is scope for further error due to *innate variability of response*. For example, the butcher cutting up some liver moves his knife a little further to one side than usual and cuts the end off his finger.

A *monitoring loop* connects the action back to the situation. In highly practised tasks, the monitoring of actions takes place at much longer intervals than in unpractised tasks and if the situation has changed unpredictably since it was last monitored, habitual actions may have become inappropriate. Such monitoring is important for the detection of errors before they lead to serious consequences. For example, a man may notice that a steel strip coming out of a machine is about to collide with a trolley incorrectly placed to receive it and push the trolley on to his feet. If his monitoring is effective, he will step back to avoid the injury.

Secondary factors. Breakdown in any of these steps could be regarded as a primary 'cause' of accidents. At one remove there are a host of secondary factors, changes in which affect the functioning of different parts of the process. These factors range from simple psycho-physical variables such as reaction time and defects in eyesight or hearing, through variables of perceptual motor co-ordination and level of skill, to more complex factors such as the level of subjective risk at which a person prefers to operate.

Others are age, experience and social factors concerned with the group in which a person is working. These and many others have formed the basis of most past research on accidents, but almost all of them have an effect at more than one stage of the process represented by the model, and this effect may be extremely complex. For example, a factor reducing the likelihood of breakdown of one part of the process may increase the likelihood of breakdown of another part; a loud noise may counteract to some extent the performance decrement due to fatigue or boredom in the collection of visual information, but it may also mask auditory information and so increase the likelihood of its being missed. Much confusion over accident causation has arisen from the failure to realize this complex interaction.

If, instead of assuming that accidents are a homogeneous phenomenon, one first classified them by the stage of the model at which a breakdown occurred, correlations with second order factors might begin to make more sense.

USE OF THE MODEL

Any model must fulfil two purposes if it is going to be of use: it must accommodate adequately the information which is available and it must enable predictions to be made. At present, the proposed model is most useful for descriptive purposes. It provides a basis on which to clarify the past findings of accident research and to try to sort out the apparent contradictions in them, such as the finding that accidents to miners increase with age (Whitfield 1954) while among lorry drivers they decrease (McFarland *et al.* 1954; Griew 1958).

The model allows a new approach by classifying each accident according to the part of the process which broke down, and this should enable better hypotheses to be formulated in the future. Such a classification differs from one based upon agent of injury or even nature of injury in that it would enable accidents to be compared over a wider range of industries. Situations which give rise, for example, to 'misperception of information' are likely to be more widespread than those involving 'power machinery in motion' or even 'falls'.

This classification requires that hazards be looked at in different ways from those which have been tried previously. Instead of considering any sharp edge as a hazard because it could give rise to injury if someone came into contact with it, the other factors in the situation must be examined to determine why on a particular occasion the person did come into contact with it; the sharp edge is only the agent of injury, and has nothing to do with the process which generated the accident.

The model also helps to bring together the research on performance decrement and on risk-taking with the study of accident causation, and indeed suggests that these are areas in which it would be most fruitful to concentrate research effort.

Ideas about the predictive use of the model are at present less developed. Ideally, it should be possible to take any work situation, feed into the model the details of the proposed work, the environmental variables and the

characteristics of the people who will be doing the job, and so to predict where accidents are likely to happen. This would show where alterations were needed to reduce the risk, but the interplay of variables is too complex for such predictions at present. A worthwhile long-term research aim would be to accumulate a bank of data which would enable such predictions to be made.

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METHODS AND RESULTS IN OCCUPATIONAL PSYCHOLOGY

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HOW SHOULD PROJECTS in Occupational Psychology be carried through? From the first step in designing a project to the final interpretation of the results, the way is beset by pitfalls. The purpose of this paper is to point out a few of the most important and to suggest ways of avoiding them, concentrating on those pitfalls which affect many kinds of study and into which many of the unwary fall.

The subject will be dealt with in the sequence in which projects are carried out, starting with the design of the study and going on to the collection of the data, the analysis and the interpretation of the results. Finally some general points will be made.

DESIGN OF STUDIES

Most projects in occupational psychology fall under one or more of the following headings:

1. Studies aimed at testing hypotheses;
2. Studies aimed at forming hypotheses;
3. Studies aimed at solving practical problems;
4. Purely descriptive studies.

Some projects include work under more than one heading, for instance the main aim may be to form hypotheses, but a subsidiary aim may be to test whatever hypotheses are formed. It is worth noting that this sequence—formation of hypotheses followed by hypothesis testing—constitutes the experimental scientific method.†

It is not always sufficiently appreciated that these different types of study call for different types of design. A study of the first type should ideally conform to the following sequence:

- (i) State the hypothesis clearly;
- (ii) Design an experiment suitable for testing it, or for testing something deduced from it;
- (iii) Collect data as designed;
- (iv) Test as designed.

†De Groot (1969) distinguishes a further heading, 'instrumental-nomological investigations', which includes test construction and validation, but this will not be considered separately here.

Studies that follow this sequence seem rather rare, particularly compared with the number of hypotheses that are put forward. Occupational psychology is still relatively young as a branch of science, so it may be that there are few hypotheses which are sufficiently general for research workers to wish to test them, but it may also be that research workers do not always appreciate that a valid hypothesis-testing study requires a design such as the above. As Galtung (1967) says of social research, "In most cases, data are collected more according to hunches than to hypotheses, and analyzed inductively more than deductively, by means of procedures discovered and invented during the process, not by means of a prescribed set of rules." Such studies may be worthwhile, but it should not be thought that any hypotheses concerned have been adequately tested.

For forming hypotheses, the best kind of design may be somewhat as follows:

- (i) Look at the situation that is of interest, and experience it in as much of its variety as possible; if possible get several people to look;
- (ii) Collect broad and, as far as possible, qualitative data about it;
- (iii) Examine the data and the situation objectively, quantifying the data only gradually;
- (iv) A hypothesis or hypotheses may form;
- (v) The consistency of the hypotheses with the data may be tested.

It should be noted that, even if the last stage is included, the hypotheses are not proved; one or more proper hypothesis-testing studies should follow.

Hypothesis forming is an essentially intuitive process, in contrast with the hypothesis-testing procedure, which is essentially logical; and that is why an entirely different design is appropriate. The intuitive nature of hypothesis formation is illustrated by an analysis of Mendeleev's notes reported by Kedrov (1969) which revealed that "scientific discovery may be thought of both as a concentration of the creative process in time and as a mental breakthrough, often triggered by some unrelated, extraneous stimulus". Such a 'mental breakthrough' is rarely on the scale of Mendeleev's discovery of the periodic table of the elements, yet some such non-logical process seems to be involved in the formation of all hypotheses that are not entirely trivial; for even if the hypothesis is merely that a relationship observed in a sample applies also to some more general population, judgement is involved, as we shall see later.

It is not difficult to form hypotheses, and there is certainly no lack of them in research literature, still less in what never appears in print; the difficulty is to form hypotheses that are adequate and reasonably general. To do this requires a broad and thorough survey of the field of interest, making every effort to keep an open mind and to avoid reaching premature conclusions. This is why the hypothesis is shown above as not being formed until stage (iv), why the first stage should include looking at as many variations of the situation as is practicable, why any data that are collected should be broad and qualitative rather than just quantitative (of which more anon) and why objectivity has been stressed (in the sense of open-mindedness).

Having questions to ask before starting the study may help in forming hypotheses because it may improve the coverage of the survey and thus reduce bias. Unfortunately, it is also likely to lead to preconceived notions and thus to incomplete hypotheses. Such preconceptions seem to be common, for instance, in studying accidents and absence, which have been variously attributed to such things as accident proneness, psychological traumas or inherent laziness without any proper consideration of other, more important factors. Because new hypotheses are nearly always related to existing hypotheses in related fields, a knowledge of previous work in the area will help hypothesis formation, though again it is advisable to beware of preconceptions.

Few projects carried out in the field of occupational psychology seem to follow the hypothesis-forming design described above, and most scientific studies fall somewhere between it and the hypothesis-testing design. These two designs are admittedly ideals, and many studies rightly share some of the features of both, but there are also many studies that could and should conform more nearly to the ideals than they do. For example, many readers will probably have experienced studies that go something like this:

- (i) Start with only a vague idea of the design of the study;
- (ii) Collect an insufficient amount of more-or-less quantitative data;
- (iii) Examine it with preconceived notions;
- (iv) Apply significance tests to everything that appears likely to be statistically significant;
- (v) Call any significant results 'hypotheses' and pretend that a proper hypothesis-testing study has been carried out.

When a study is intended partly for testing existing hypotheses and partly for forming new ones, the two parts should be clearly distinguished (De Groot 1969), both in carrying out the work and in reporting it. Thus each part can conform to the appropriate design as described above, and the report will not pass off the new hypotheses as having been adequately tested.

The third type of study, aimed at solving practical problems, is not much concerned with hypotheses, but it might well start in the same way as a hypothesis-forming study:

- (i) Look at the situation; if possible get several people to look;
- (ii) Think of as many things as possible that might have contributed to causing the problem;
- (iii) Collect as much data about them as is practicable;
- (iv) Analyse the data to find the most likely causes;
- (v) Make tentative alterations and observe the consequences.

Stages (iii) and (iv) may be omitted if the alterations are easy to make or obviously needed anyway.

The importance of stage (ii) has been pointed out by Buzzard and Radforth (1964), who say, "A wide range of factors can affect behaviour at work and people are affected by them in varying degree. Thus there are usually many possible explanations of differences between the behaviour of one group and another especially when these are measured in terms of

statistical averages. Consequently, what may seem to be an 'obvious' explanation of a difference may be no more than the explanation that first comes to mind. The confidence with which it can be accepted as the real or the most important cause depends on the extent to which other causes have been looked for and taken into consideration." Buzzard and Radforth give a list of nineteen of the more important factors known to affect absence rates and rates of sickness and injury. An examination of previous work in the area of study may add to the list of factors which may have contributed to the problem, or a checklist might be used (Toplis 1970).

The fourth type of study, which is purely descriptive, is similar to the early stages of studies aimed at solving problems or forming hypotheses. Again, open-mindedness and a comprehensive view of relevant factors are needed.

There is a great deal to be said about the later stages of design but no space here to say it. In particular, before-and-after studies, the use of control groups and other kinds of experimental design should be carefully thought out before they are applied.

DATA COLLECTION

It is well known that criteria of performance present major problems. Even the most reliable and objective criteria, such as production records, are often less reliable than they seem; for instance any records used for calculating bonus payments should be eyed with suspicion because of the common practice of adjusting the rate of working or the amount of work recorded to keep the wage packet fairly constant from one week to another. Sometimes bins partly filled at the end of the day are added to the next day's output. Sometimes variations in quality are not allowed for: we know a factory where men are paid bonus for work which is subsequently rejected by the inspectors, and they are paid bonus again for putting it right. Very often there are differences in the work done or the materials used by different people who are nominally doing the same job, and these may greatly affect the output and other criteria. Such differences, for instance, were found to be one of the most important causes of variations in accident rates in an NIIP study of two light engineering workshops (Powell *et al.* 1970). Similarly, studies of punch operators have shown that their output is affected by many factors including the machines they use and the legibility of the documents they work from (Johnston 1964). It is sometimes supposed that such variations balance each other over a period of time, but this is often untrue: for example, the most difficult work is frequently given to the most experienced workers.

Other criteria, such as supervisors' appraisals, are not even apparently reliable; yet they often need to be used because otherwise the assessment of performance would be incomplete. For instance, the effect a man has on his superiors, colleagues and subordinates may be an essential part of his total performance, but it cannot be estimated except by unreliable and subjective measures. In general, the higher the level of job, the more important are appraisals by supervisors and others. Appraisals are often much less reliable

than they could be, however; common faults include lack of training of appraisers, too much reliance on rating scales that do not encourage the rater to support his judgement with written descriptions of performance, and vague definitions of the behaviour to be rated. Appraisals should be job oriented, concentrating on the more objective aspects of the work rather than on traits of personality. Properly designed appraisal procedures can provide good criteria, particularly if each man can be appraised by several people.

In most studies that are concerned with practical problems, it is desirable to use several criteria of performance, such as output, quality, supervisors' appraisals, absence, accidents and tenure (or labour turnover). This is because improvements in terms of one criterion may be achieved only at the expense of others. For example, in one group of punch operators the more intelligent girls learnt faster and produced more, but they also left the company sooner. If the study had not included tenure as a criterion, the company might have decided to select only the most intelligent applicants, and this for them would have been a mistake. Unfortunately it is often impossible or too expensive to obtain all the desirable data, so many studies are based on only one or two criteria.

Personnel records are, or should be, the most useful source of data for research in occupational psychology, besides giving companies essential information about the people they employ. But these records need to be both accurate and comprehensive, as Buzzard and Radforth have pointed out; otherwise there are inadequate criterion data and also inadequate data on the many factors that may affect the criteria. Very few companies, however, have personnel records which are as accurate and comprehensive as is to be desired: the NIIP's research studies have shown that essential information is frequently incorrect or not recorded. Perhaps surprisingly, this is often associated with a firm's having too many records, which have been designed *ad hoc* and do not form a co-ordinated system. A fairly typical example was found in one factory, where there were no fewer than fifty different forms and documents which related to new employees up to the time they started work, but there were no proper job descriptions and no appraisal procedures for any level of staff.

Every company has different needs and circumstances, and each record system should be made to measure. For this reason the NIIP Methods and Statistics Department has been concentrating on developing a procedure for setting up systems; this starts with an assessment of all the needs for personnel information and continues with the design of the system in progressively greater detail.*

Data collected for specific studies should beⁿ in a form suited to the type of study. For testing hypotheses, the data should if possible be quantitative and structured. This means that questions should usually be standardized, and either the respondents should be given a limited number of answers to choose from or else the interviewer or analyst should allocate the response

*The results are to be published in a series of practical handbooks and courses currently in preparation, backed up by a service of advice and assistance to companies, which is already in operation.

to predetermined categories. Similar categories would be used for any directly observed data. As Galtung points out, structured techniques are cheaper and more reliable than unstructured ones, and they make it easier to compare different respondents or situations.

For forming hypotheses the data should be more qualitative (as mentioned earlier) and unstructured. Questions should usually be open-ended and need not be standardized; observations should be recorded descriptively, whether or not this is backed up by taking measurements. The new hypothesis may even originate from the stage before observations and answers are recorded, i.e. it may suggest itself to the observer or interviewer while he is observing or listening. The reliability and comparability of structured techniques are unimportant here, and the flexibility and naturalness of unstructured techniques overcome the extra cost of analysing the data, if analysis is required.

Descriptive studies and studies aimed at solving practical problems are likely to be closer to the formation than to the testing of hypotheses and therefore to require rather qualitative, unstructured techniques.

ANALYSIS

Analysis must take account of as many as possible of the factors which are likely to have affected the data concerned, as already mentioned: failing this, the conclusions reached from the study are of dubious validity. For example, consider some results from a study of sick leave among railwaymen threatened by redundancy (Owens 1966). Two populations of approximately equal average size were considered: (I) all the employees in several small wagon repair shops not due for closure, and (II) all the employees in the wagon repair shops of a depot due for closure at the end of the study period. Information was obtained about each worker who took sick leave, and this showed that sick absence was more than twice as frequent in the population threatened by redundancy as in the control group. Table 1 shows the distribution of absence by length of service.

TABLE 1
NUMBER OF ABSENTEES BY LENGTH OF SERVICE

	Length of service (years)					Total number of absentees	Mean population
	5/14	15/24	25/34	35/44	45+		
"Sample I"	8	4	1	3	2	18	475
"Sample II"	10	22	7	1	1	41	461

The conclusions drawn from these figures were that "there was a marked relationship between length of service in the industry and the incidence . . . of sick leave. Whereas in the sample drawn from a stable employment situation absence on sick leave was highest among those who had spent fewer years with the industry, in the case of those threatened by redundancy, though there was little intersample difference among those with

fewer years' service, the difference was great during the period when men had spent half their working life in the Railways." The author suggests, as an explanation of this difference, that "when an individual has spent from fifteen to twenty-five years with a single employer . . . the anticipation of involuntary termination of his service may be traumatic in its effect."

The evidence for this is tenuous, and it seems much more likely that the effects are due to the distributions of length of service in the populations. Apparently no information was obtained about these, but it would be very unusual to find a workshop with the same number of people in each length-of-service group, and rather unusual to find two groups of workshops with the same length-of-service distribution. Therefore, there may well have been more short service than longer service employees in Population I; together with random variation and perhaps other factors such as differences between jobs this could explain the data for Sample I. Similarly Population II may have contained a large number of employees with between 15 and 24 years of service; such 'bulges' often occur when a factory has expanded rapidly at a particular time. The mistake was to look at the length of service of the sick people without also considering those who were well. It is always rash to draw conclusions without first examining such factors as the length of service, age and jobs of the populations.*

The analysis, then, should include as many as possible of the factors that may be relevant (i.e. independent variables) and often several criteria too (i.e. dependent variables). Such an analysis is often difficult to handle. This is partly because the so-called independent variables are usually related to each other (e.g. age, sex, length of service and job are usually interrelated, and so are scores on different tests, education and job history) and partly because the variables are often a mixture of interval (e.g. test scores), ordinal (e.g. level of qualification, rating) and categorical (e.g. sex, job) types.

It is often best to start by examining the distribution of each variable and then to prepare tables of frequencies, totals or mean values relating each dependent variable to the independent variables taken one, two or more at a time. For example, if labour turnover is a dependent variable, it could be tabulated for each department, each age group, each sex, each length-of-service group, and so on, and also for combinations such as age by sex by length of service. It is often dangerous to omit this stage and start straight away with sophisticated techniques such as multiple regression. Even linear correlations or ratios may mislead if the raw data are not examined first.

This stage may enable certain variables to be omitted because they appear to have negligible effects, and it will show which variables are likely to interact. To elucidate the effects of groups of interacting variables it may be necessary to use such techniques as multiple regression or analysis of variance. Ordinal variables and mixtures of different kinds of variable are often particularly difficult to deal with in this kind of analysis because of

*The terminology of the article is also liable to confuse. To speak of 'samples' which were 'drawn' from the populations implies the usual statistical meaning of these words; but in fact the men 'drew' themselves by going sick; and the 'samples' are not regarded as representative of the populations, for if they were the conclusions would fall to the ground.

limitations in the statistical techniques available and the care that is needed to choose techniques that are appropriate. Another reason why mixed data are a nuisance is that different techniques are required for the different kinds of variable or different combinations of kinds. This applies particularly when a computer is used, because programmes for multivariate statistics are not really suitable for categorical data, while most programmes for survey data (which are mainly categorical) can do little with continuous variables, apart perhaps from simple correlations. Non-parametric statistics call for yet other programmes, and the different programmes often require the data to be presented to the computer in different forms. A set of compatible programmes for analysing the mixed data that are so often found in occupational psychology would be a real boon.

A rather different problem arises when one variable consists of a fairly large number of categories and each category contains very few individuals. This happens, for example, when a study takes data from a number of companies, in each of which only a few people do the job being studied. Multi-variable analysis is difficult to use in such cases, and it may be better to employ the matched pairs technique, as in two recent NIIP studies (Crawley and Morris 1970; Martin 1971). The decision to use this technique should be taken at the stage of designing the study, if at all possible, in which case the collection of the data may be simplified. „

INTERPRETATION OF RESULTS

Some obvious, though not uncommon, mistakes arise in interpreting the meaning of statistical significance. If a certain result is 'significant at 5 per cent' people sometimes suppose that is therefore important, or significant in the more general meaning of the word. This is not necessarily so at all, for instance a correlation of 0.2 may be statistically significant but of no practical value, whereas a correlation of 0.4 might be of practical significance although it was not significant statistically because the sample was too small. In the first case the research worker has proved something, but it is of no importance; in the second he has merely failed to prove something that is important if it is true—he has certainly not disproved it, and indeed the correlation of 0.4 means that the true value is more likely to be about 0.4 than any other value, unless other considerations suggest the contrary. In any case, significance and non-significance are relative terms because the choice of 5 per cent, 1 per cent or some other figure for the threshold of significance is nearly always made arbitrarily.

Correlations do not necessarily indicate cause and effect. A very high correlation was once found between the number of radio licences issued each year between the wars and the number of registered mental defectives. Whatever the reason for this correlation, it was obviously not cause and effect; but many cases are less clear. For example, Hayes (1969) reports a study by A. L. Brophy in which nurses completed check lists to describe themselves and the kind of person their job requires, and they also completed a job satisfaction questionnaire. The results showed that people with a large

discrepancy between self and job concepts tended to have lower satisfaction scores than those who saw self and job as being more alike. Now, it would be tempting to interpret this correlation as meaning that if people are suited to their job they are likely to be more satisfied than those who are less suited, but it is also possible that the causal relationship goes in the opposite direction, at least partly, i.e. if a nurse is dissatisfied with her job she may tend to rationalize this in terms of the job not suiting her.

Another possibility is that the correlation between the two variables may be due to a third variable which is correlated with both. For instance, consider the following hypothetical but perfectly possible case of a factory where absence rates are correlated with age, but only because both are correlated with length of service:

- older men tend to be absent less than younger ones;
- older men tend to have longer service than younger ones;
- long-service men tend to be absent less than short-service ones;
- but, within each length-of-service group, older men tend to be absent *more* than younger ones.

The negative correlation between age and absence rate is explained by the fact that both are correlated with length of service; the true correlation—the partial correlation—is positive. To put it in terms of cause and effect, it appears that in this factory long service causes lower absence and high age causes higher absence. But this does not mean that as a typical employee grows older his absence will increase; it will decrease, but only because his service lengthens. This example shows that, even with only three variables, cause and effect can be tricky to sort out. A similar though less extreme example is reported by Fletcher and Simon (1962).

Problems arise in generalizing from the group of people who have been studied to some wider population. When the group has been drawn by random sampling from a population, any results that are statistically significant can rightly be applied to the population. Often, however, the group has been determined by some other means, and it is then tempting to assume some wider generality than is strictly valid. As Galtung says, "Propositions are presented with sweeping generality, as valid for mankind from eternity to eternity, where a specification [of the conditions of assumed validity] might read 'at least as far as students in the Psychology 1 course at X college, located in Mid-West, U.S.A., spring of 1959, are concerned'."

Part of the trouble is that results which are valid only for a particular small group are of little general interest and often of no practical use. A case in point is a study of applicants to a university department of architecture, reported by Stringer and Tyson (1968), in which interviewers' ratings were compared with scores on the Dynamic Personality Inventory. The authors state, with admirable caution, that "the evidence suggests that the seven interviewers have a fairly consistent tendency to react favourably to interviewees whose self-image, as reported on the DPI, shows high creative interest and femininity, low submissiveness to authority, conservatism and passivity . . ." The reader, who probably has little interest in what happened

at the Bartlett School of Architecture between 1964 and 1966, may like to consider how probable it is that each of the following statements is true:

- (1) Interviewers at the Bartlett School tend to prefer applicants with high creative interest, etc.;
- (2) Interviewers tend to prefer applicants for architectural courses who have high creative interest, etc.;
- (3) Applicants with this personality profile tend to do well in architectural courses;
- (4) The Bartlett School should use the DPI as part of its selection procedure;
- (5) Untrained interviewers seem able, as a group, to respond fairly consistently to a number of not irrelevant personality characteristics of their interviewees.

In fact, of course, we cannot be sure of the truth of any of the statements, though there is something to be said for all of them. Those statements which are of most general interest or of most practical importance (such as nos. 3 and 4) tend to be the least certain. The authors accept only no. 5, though they point out that it is worth considering the possibility that applicants with the preferred profile might fare just as fortunately in other selection contexts. In studies such as this, it is important to use careful judgement in deciding what conclusions can validly be reached and what hypotheses are worth testing in future work, and to make these things clear to the reader.

Statistical analysis deals only with averages, totals and the like. It therefore cannot predict the outcome in individual cases.* As Jorden (1968) points out, managers are nearly always confronted with individual cases, and this limits the applicability of the results of statistical analysis in practice. This is why the widespread illusion that selection can properly be based on test scores alone is false: even a high correlation between tests and job performance will conceal some individuals who do badly on the tests but well on the job, and vice versa; consequently test scores need to be interpreted and supplemented by interviews. The individual needs individual treatment; statistical results may be relevant but are not enough.

If the occupational psychologist is constantly aware of this limitation of statistics, he may be prompted to further discoveries. As Frisby (1944) has said, "the variability of human beings is such that the individuals forming the group may respond in widely different ways. Some may show a benefit from the changed conditions, some may appear to be unaffected," and some may seem to have suffered a disadvantage. In such a case the total, or average, result may be that a change in the factor investigated produced no significant result on the workers. If the experimenter who obtains such a total result is content to leave his enquiry at that point, he misses what may be its most valuable contribution." Murrell (1968), in a critique of reported ergonomic studies, refers to similar individual differences which appear in vigilance

*Except in terms such as "an applicant with these qualifications has an 80 per cent probability of succeeding at the job"; but this only means that out of one hundred applicants about eighty will succeed.

experiments when, although the performance of the majority of the subjects declines, that of others may remain level or even improve. He suggests that some uncontrolled factor is involved. Such exceptions to correlations and averages are frequent throughout occupational psychology, and it seems likely that if more attention were paid to them, e.g. by looking for possible uncontrolled factors, the frontiers of knowledge would be advanced.

A GENERAL VIEW

Surveying the ground we have covered, we can see that we have travelled in a circle, for our discussion of the interpretation of results has naturally led us back to the formation of new hypotheses, to the discovery of new factors which may account for variations in the results. During the discussion of hypothesis-formation and the solution of practical problems, emphasis was laid on open-mindedness and considering all the factors that might affect the data; such receptiveness and exploration now reappear in looking at exceptions, instead of ignoring them, and looking for factors which have not already been taken into account.

We all have minds which are closed to many things. Our upbringing and environment largely determine our frames of reference, which predispose us to look for some things and ignore others, to accept certain hypotheses and reject others out of hand. People today share the same environment to a greater extent than ever before, so there is a tendency for widely held beliefs to become universal assumptions. Such assumptions are made not so much because they are true as because they are unchallenged and therefore almost unchallengeable. Looking back into history we see that many of the most important discoveries have run contrary to the most widely held beliefs of the period. There is no reason to suppose that our own time is any different, and if there is one thing that can be said with certainty about science a hundred years from now it is that many of our present theories will seem absurd and we shall appear to have been blind to obvious facts. We should try to remove our blinkers.

How can we distinguish those concepts and those methods in occupational psychology which are likely to have long-term validity and wide applicability from those which are more limited? One way is to judge by results, though it is necessary to observe those results comprehensively and objectively. Another is suggested by Snygg (1955): "It is not likely that the methods of the physical sciences can, without basic changes, be adequate for the prediction of organismic behavior. . . . All of the laws of physics are special cases of the entropy principle by which matter tends to go into disorder and energy to become dissipated. Since it is the peculiar characteristic of living organisms that they organize matter and concentrate energy we should not expect that their living behavior can be predicted from the laws of physics which predict how they would behave if they were dead." Further, since human beings not only live but have the powers of intellect, creativity, and self-awareness, not even the biological sciences can be entirely adequate to predict or explain their behaviour. Maslow (1970) and Joynson (1970)

have also mentioned the danger of psychologists limiting themselves to the concepts and methods of the natural sciences.

Theories that treat human behaviour in terms of mechanistic analogies or animal characteristics, such as electronic circuits, reflexes or instincts, have the danger that they tend to change from analogies into attempts to explain man in purely physical or animal terms, or to be regarded by people other than their authors as explaining man in these ways. Any theory that states or implies that human behaviour is entirely predetermined by physical or other causes has a basic flaw in its logic. For, if it were true, then that part of human behaviour which is concerned with developing theories would be entirely predetermined, making it inevitable that the author of this particular theory should develop it; it is, therefore, illogical for him to assert that his theory is true. Theories and methods that treat people as less than fully human in this kind of way are often encountered in the field which occupational psychology deals with, e.g. Taylorism, some theories of motivation and methods which attempt merely to manipulate people.

We saw earlier that it is insufficient to make only quantitative observations when seeking to form hypotheses, while ignoring the more qualitative aspects, and that it is insufficient to consider only averages, while ignoring individuals. These errors fit into the same pattern we have just been considering: they are further examples of over-simplifications which tend to debase man.

As research workers and practitioners in occupational psychology, we need to be constantly aware of the methods we are using and of their implications, and the present article has been intended as a contribution to this end. But it is perhaps as well to remember, in conclusion, that methods are only means to an end. "Criticism in the scientific literature," says Maslow, "seems usually to mean only criticism of method, technique, logic, etc. I do not recall seeing, in the literature with which I am familiar, any paper that criticized another paper for being unimportant, trivial, or inconsequential. . . . I do not wish to underplay method. . . . The working scientist must, of course, be concerned with his techniques, but only because they can help him achieve his proper ends, i.e. the answering of important questions."

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PRIVACY AND THE OCCUPATIONAL PSYCHOLOGIST

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OCCUPATIONAL PSYCHOLOGISTS may be personally involved in the issue of privacy on two main grounds, intrusion and disclosure. The first concerns the collection of personal information by means of interviews, questionnaires, reports and psychological tests; the second concerns the subsequent handling of this information.

When there is a complaint of invasion of privacy in industrial interviewing it is usually either a matter of relevance, i.e. the individual in question has been asked for information which he regards as of no concern to the interviewer, or a matter of confidentiality, i.e. information about him has been passed on to people who he feels should not have it.

In interviews for employee attitude surveys conducted by the NIIP, the interviewer invites the man or woman to tell him whatever he likes about the firm employing him. There is neither coercion nor direction and a guarantee is given that in the report to the sponsors of the survey no names will be attached to statements unless the speaker expressly wishes to be associated with his views. Furthermore, it is emphasised that no comment will be included in any report if it is likely to identify him. This guarantee of anonymity is the foundation of the technique. No problem of privacy can arise. There can be no complaints of irrelevance since the subject discusses only those matters he wishes to ventilate; confidentiality is guaranteed.

This is not the case with the selection interview. Before calling his candidates, the selector will have undertaken a study of the job and will have decided what qualities are essential and desirable in the successful candidate. He will probably have sent the candidate information describing the duties and responsibilities of the job and the physical, social and economic conditions appertaining to it. Almost certainly he will have asked the candidate to complete an application form calling for information about schooling, work history, health, spare-time interests, domestic circumstances and "any other information you wish to add in support of your application". Thus when the candidate appears for interview he will already know something about the vacancy, and the selector, having studied the application form,

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will have some information about the candidate. The candidate's intentions are usually, but not always, to present himself in such a way as to be offered the job. The interviewer's intentions are to elicit relevant information about the candidate's capacities and inclinations so as to predict his future effectiveness and satisfaction in the job. The paper, *Privacy Under Attack* (Madgwick, 1968), recognized the importance of ability in determining a candidate's suitability for a vacancy but overlooked the importance of job satisfaction.

The conventions of interviewing generally recognized by occupational psychologists and professional personnel interviewers are, first, that no coercion is exercised upon the candidate—the practice of stress interviewing is deplored—but this does not exclude searching questions; and, secondly, that interview information will be divulged to others only with the candidate's consent, either implicitly or explicitly—certainly the latter where there is any possibility of doubt.

In practice, things are different. Although there is no coercion, the candidate who wants the job will feel obliged to reply to questions he might regard as personal. Not to do so would, he might feel, displease the interviewer who in this circumstance has the power. To overcome a candidate's reluctance to reply, however, the trained interviewer will create a climate where such questions can be put and answered without embarrassment or resentment. By 'personal' the candidate usually means irrelevant (to that particular situation) but he has no means of knowing, unless he is familiar with personnel practices, what information is relevant to recruitment. Only the interviewer knows this. Similarly, the interviewer has only a hazy idea of what the candidate regards as personal. One man's privacy is another's pride. But the areas regarded as personal by the candidate usually include his race, political views, religion, father's occupation and the kind of person his wife is. These and other aspects of his private life, however, can be of importance to the interviewer in assessing his suitability for a job. It would, for example, be an error on the interviewer's part not to enquire of a candidate for an overseas post what his wife felt about living abroad. A Jewish sales representative is unlikely to make much headway with Arab customers. Similarly, some strongly held political or moral attitudes could make it imprudent for an individual to enter a particular employing organization: a convinced teetotaler will probably be uneasy working in a brewery. Father's occupation may give indications of the candidate's educational and cultural opportunities, home circumstances, social patterns of behaviour and hints about his motivation. It must, therefore, be up to the interviewer to decide what is relevant; and the greatest safeguard against irrelevant questioning is the proper training of interviewers.

The disclosure issue is more difficult. The conventions mentioned above include cautions about obtaining and interpreting references. Occupational psychologists recognize that the very act of making an application is confidential, but some—and here opinions are divided—would like the interviewing room accorded the same status of confidentiality as the confessional and the consulting room. Selection, however, is not so private a matter as salvation or health and the purpose of the interview is to collect information

which more often than not is to be reported to others. Indeed, the candidates *expect* that the information they give will be passed on in spite of any assurances the interviewer may give them of confidentiality. To resolve this double-think situation, some occupational psychologists and, presumably, professional personnel officers whose duties include interviewing, might welcome guidance as to degrees of confidentiality along these lines: information that (a) must not leave the interviewing room; (b) may only be passed to senior members of the employing organization; (c) may be common knowledge within the firm, and (d) the world may know. If the candidate were the arbiter of this, as clearly he has a right to be, and every remark he made were classified, selection interviewing would become impossible. Thus, in his dilemma, the occupational psychologist resorts to his conscience in deciding what information he may convey to others in order that he may adequately serve his client in his professional capacity, and at the same time avoid harm to the present employment, self esteem, reputation and privacy of the individual whose interests he also serves.

It must be for the psychologist to decide what confidential information, if any, should be passed on in support of his assessment or recommendations, and also the manner in which it should be presented. His training, experience and the ethical practices of his profession will guide his judgement. This means that he will wish to refrain from disclosing information which, used out of context, could adversely affect the welfare of his subject, now or later on. But while a code of ethics is evolving to guide psychologists who belong, for example, to The British Psychological Society, assistance in selection, attitude surveys or vocational advice is increasingly being offered by people with little or no training and belonging to no body which can guide the development of an ethical code for them. The demands of privacy may make professional registration of psychologists desirable.

In an imperfect world this inevitably means that there are those who are rigorous and those who are slack in these matters, but it is unlikely that gross abuses of confidentiality frequently occur in professional interviewing in industry through the negligence of psychologists. There are practices, however, where the likelihood of invasion of privacy in industry may be greater than in interviewing by professionals although they are related to it. Those which merit special scrutiny are:

- the use of ill-constructed psychological tests by untrained people (Toplis 1969);
- the disregard of the confidentiality of test scores which has led to the trafficking of test scores between employing organizations (Dodd 1969);
- the insensitive administration of unproven personality inventories by untrained people for selection purposes (Dodd 1969).

Linked with these practices are problems arising from storing personal information whether it has been obtained in confidence or not. As the significance of biographical details varies with time, the utmost caution should be exercised in deciding what items should be put on permanent

record. Much will be determined by the purposes of the record. Some records of personal details are kept simply as records but all can serve in one way or another as a basis for making judgements and decisions about people. At the moment the problem, though growing, is not very great because records are fragmented and dispersed. With the advent of the computer, however, it is not difficult to foresee that the time may come when all records about an individual could be simultaneously accessible. In this way, for example, his police record, bank statements, passport details, medical record, memberships, school record and employment record could all be available to one (authorized or unauthorized) person for decisions about, say, security or other aspects of his suitability for a particular post.

It might be thought that such decisions could be improved by amassing information in this way; paradoxically, even if the information were accurate, there is a danger of their being impaired through an increased chance of misinterpretation. Suppose, for example, it is noticed that someone has had an early brush with the Law. This might be interpreted as a black mark against him in middle age when the fact is no longer of any significance to his assessment. Likewise, a permanent record of psychological test results can distort judgement. In trained hands these can be useful aids to assessment at the time they are applied but because of the imperfections of such tests as measuring instruments and because people's performance in them varies with age and experience, there are dangers in using 'old' results, the more so if they fall into untrained hands.

The chief threats to a worker's privacy appear to be first, disclosure of personal information collected in confidence and, secondly, the misinterpretation of stored information. At the present time his only protection lies in the considerate behaviour and professional standards of interviewers and others to whom he gives confidential information.

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THE MENTAL DIFFERENCES BETWEEN INDIVIDUALS*

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When he wrote this paper the author was psychologist to the London County Council and in charge of Vocational Guidance at NIIP, where he remained until becoming Professor first of Education and later of Psychology at London University.

THE MOST REMARKABLE ADVANCES made by psychology during recent years consist in the rapid development of what threatens to become a new and separate branch of science, the study of individual differences in mind. Down to the close of the nineteenth century psychologists were all pure psychologists. They confined themselves, with an air of chaste aloofness, to the discussion of mind in general; they wrote and experimented solely on the abstract functions of consciousness as such. . . .

Of late, however, a body of workers has arisen who have turned their attention more especially to the peculiarities of particular minds. The variations have attracted them more than the averages, and the mental disparities between childhood and age, between race and race, between one sex and the other, and between each unique individual and the rest, have formed their chosen topic. As a result of their labours, there has grown up, step by step, a vast and miscellaneous accumulation of data which urgently demands to be sifted and systematized. The practical needs of applied psychology, in each of its fresh spheres—the psychology of war, of education, of industry, of mental disorder, deficiency and crime—all depend for their solution upon a sound doctrine of individual differences; and their study in its turn has already contributed much welcome information to the parent science. I propose, within the limits of the time allowed me, to attempt a summary of the chief problems and principles of this new branch; and, as methodically and as completely as is possible within so narrow a compass, to plot out the ground explored by recent work. . . .

PHYSICAL CONDITIONS

Of all the physical influences studied in recent years the most striking is that of the ductless glands. Every layman knows that thyroid insufficiency produces a cretinous type of mental defect, and that such defect may be cured or alleviated by the administration of glandular extracts. And just as thyroid insufficiency depresses, so thyroid excess may heighten, emotional

*An Abstract of the Presidential Address to Section J (Psychology) at the British Association Meeting in Liverpool, 1923. Reprinted from *Jl NIIP* 1924, 2, 67-74.

states and reactions. Of other glands belonging to this class—the pituitary, the adrenal, and the sex glands—we know far less. But recent work upon their internal secretions has left no doubt as to their power over temperament and feelings. . . .

It may perhaps be thought that bodily indications are of value only in cases of extreme pathological deviation—the obese, the emaciated, and the physically deformed; they are symptoms for the doctor, not signs for the plain man. Is there, then, no means of deducing a man's character and capacities from his external appearance,—

. . . no art

To find the mind's construction in the face?

And, if not, why do so many men and women of the world claim to divine character at a glance, and profess, on the basis of a first impression and a short superficial inspection, to gauge intelligence and temperament, even among their normal fellow creatures, with much the same exactitude which is conceded to the dog-fancier, the sheep-dealer, and the fellow with an eye for horseflesh in their somewhat lowlier spheres? That their intuitions (as they term them) often correlate highly with independent and trustworthy estimates has been shown statistically time after time. Upon what do they rely? Is there a sort of moral clairvoyance confined only to a gifted few? Or is the miracle of insight into another, a knack that each can achieve? In part, these judges of men are aided, more than they themselves suspect, by semi-social criteria—accent, phraseology, manners, the elegance of handwriting, and the tidiness of clothes. For the rest, so far as their procedure is unprejudiced by pseudo-scientific reading, it seems to depend chiefly upon inferences, conscious or unconscious, not so much from bodily structure or build as from bodily posture and movement, particularly the finer movements of the hand, of the eye, of the lips and mouth, and of the vocal organs in speech. . . .

In the main, however, the gist of recent scientific work on connections between body and mind has been, from a practical though not from a theoretical standpoint, negative. Theories, such as that of Lombroso and his school—the notion of criminal, defective, neurotic, and supernormal types, each marked off from ordinary mankind by a specific combination of physical and mental traits—have been exploded by more careful statistical methods. The measurable correlations, though frequently positive, are almost always too slight to be trusted for the needs of diagnosis. Thus a man's exterior is sometimes suggestive, but never conclusive. And so we reach the safe and central maxim of individual psychology of to-day: *Judge mental functions by mental symptoms, not by physical.*

MENTAL CONDITIONS

I proceed now to what consequently becomes the essential duty of the practical psychologist—the direct examination of the mental state.

The positive foundations for a practical psychology of individual differences have been laid in three broad generalizations, each the separate

suggestion of experimental work. They consist in a triad of important distinctions, the distinction between intellectual and emotional characteristics, between inborn and acquired mental tendencies, and between special and general capacities. . . .

Intellectual Characteristics

With these distinctions, then, to mark our working rubrics, we begin by viewing any particular mind, that comes for valuation, as presenting two distinguishable aspects, the intellectual, on the one side, and the emotional on the other. . . . Intellectual qualities are correlated fairly highly amongst themselves. Emotional qualities (so far as the more meagre evidence at present shows) are likewise correlated to nearly the same considerable degree. But the correlations between intellectual qualities on the one hand and emotional on the other, though still as a rule positive, are by comparison conspicuously low. We are warranted, therefore, in assuming that these two aspects are relatively independent, and in studying them separately and in succession.

Inborn Abilities

We proceed to estimate, in the first place, the examinee's qualities of intellect. And here our second subdivision introduces itself—the distinction between what is inborn and what is acquired. Many independent researches agree in showing that intellectual characteristics are hereditary, and that to much the same extent as physical. . . .

General Intelligence

For the existence of general inborn intellectual ability (known briefly as 'intelligence') the statistical evidence is now pretty decisive. Even the critics of this so-called 'central factor' no longer deny that, at least as a matter of mathematical interpretation, the empirical data may be formulated in these terms; and that this formulation, whatever its ultimate psychological explanation, is of the greatest value in practice, and, as a working hypothesis, works very well. . . .

Since intelligence, as we have defined it, is an inborn quality, the amount possessed by a given individual should, in theory, remain constant through all the years of his life. It should thus be possible to predict, from quite an early age, what will be the probable intellectual level of a child when he is grown up. Within reasonable limits such forecasts can, in fact, be made. Numerous investigations have shown that what is called the 'mental ratio'—the proportion, that is, between a child's mental age and his chronological age—tends to keep tolerably uniform throughout the years of growth. Hence it is safe to prophesy that a child (for example), aged five by the calendar with a mental age of two (and a mental ratio, therefore, of $\frac{2}{5}$ —40 per cent), will probably attain a mental age of four at the age of ten, and a mental age of six at the age of fifteen. Since beyond the stage of puberty inborn intelligence does not develop to an appreciable extent (another startling paradox

of psychological testing), such a person will never rise above the six-year level, and will remain mentally defective for the rest of his life.

Its Range

From the numerous results obtained from the widespread employment of intelligence-scales, one fact of deep social significance emerges—the vast range of innate individual differences. A famous clause in the American Declaration of Independence proclaims that “all men are created equal”. In the psychological sense as distinct from the political, not only are men created unequal, but the extent of the inequality surpasses anything before conjectured. In a survey carried out upon all the children in a representative London borough—a census covering more than 30,000 cases—it was found that, within the elementary schools, the mental ratios might vary from below 50 per cent to above 150 per cent; that is to say, the brightest child at the age of ten had the mental level of an average child of 15, while the dullest had the mental level of a little child of only five.

Over this vast scale the distribution of intelligence is neither flat nor yet irregular; it follows a simple mathematical law. Its frequency conforms to the so-called ‘normal curve’, and the abnormal and defective are found to constitute no isolated types, but to be simply the tail-end of a chance distribution. . . .

Practical Conclusions

Since variations in intelligence are so wide and so continuous, it becomes convenient to divide the entire population into about six or eight separate classes or layers. A classification of this kind, worked out empirically, for children, is already implicitly embodied in the organization of our various schools. A second classification can be drawn up, on an analogous basis, for adults, and will be found, in the main, to reflect the amount of difficulty and responsibility entailed by their several occupations. It is interesting to find that the proportionate number of individuals falling into the parallel sections tallies pretty closely both for adults and for children. Here, therefore, lies a simple aim alike for educational administration and for vocational guidance. It is the duty of the community, first, to ascertain what is the mental level of each individual child; then to give him the education most appropriate to his level; and lastly, before it leaves him, to guide him into the career for which his measure of intelligence has marked him out. . . .

The determination of intelligence is equally indispensable for proper vocational guidance. Respecting intelligence, indeed, vocational psychologists seem unanimous that, as it is the easiest, so also it is the first and foremost factor to be tested. The worst misfits arise, not from forcing round pegs into square holes, but from placing large pegs in little holes, and small pegs in holes too big for them to fill. We have already seen that different occupational groups have different intellectual levels. For nearly every type of employment there exists a certain minimum of intelligence, below which a man is pretty sure to fail. For many, if not most, there is also, in all probability, an optimal upper limit. Just as some men are too dull for their jobs, so others

are too clever. Hence, in the interests of the employer and of the employment, as well as of the employee and the general community, it is a blunder always to pick the brightest candidate who applies for a given job.

In this country, for the purposes of vocational selection, the most extensive application of intelligence-testing has been the introduction of a psychological 'group-test' into recent Civil Service examinations. The papers, comprising five or six graded speed-tests of well-known types, have been drawn up, after experimentation, by professional psychologists. Some 40,000 candidates have been tested in this way. And the calculated correlations demonstrate that the results of the new methods agree with the total marks from the whole examination more closely than any other single paper set. . . .*

SPECIFIC ABILITIES

- Over specific inborn abilities I need not linger. For them effective tests have proved disconcertingly hard to contrive. . . . Nor do these special abilities, although presumably inborn, declare themselves at so young an age as the more general. Specialization during the first twelve years of childhood is the exception rather than the rule. "Young turtle," said Epicurus, "is every kind of meat in one—fish, fowl, pork and venison; but old turtle is just plain turtle." Similarly, the young child contains in fresh and dormant essence the germ of every faculty. Age alone betrays our idiosyncrasies. Adolescence is pre-eminently the period when many of these localized talents and specialized interests seem for the first time to mature. Accordingly, efforts at vocational guidance and educational specialization must not be forced at too early a stage. At present, for example, the system of junior county scholarships tends to sweep all our brightest children at the age of ten or eleven into secondary schools of a somewhat academic type. When at a later period examinations are held for trade schools, most of the best instances of special talent are missing: they have already been creamed off and drafted into other directions less suited to their powers.

Their Enumeration

So far as it has been successful, the results of multiple correlation, eked out by other scattered indications, point to the following abilities as depending upon factors relatively specific: arithmetical, manual (drawing, writing, probably handwork of simpler kinds), verbal (reading, and spelling), literary (composition in one's own tongue), linguistic (learning foreign languages), artistic, and musical, the last named often appearing at an unusually early age. Of such specific or 'group' factors the specificity is not complete. There is much overlap; and, with every one of them, it is extremely hard to frame tests which depend mainly for success neither upon the 'central factor' of general intelligence, nor yet upon some particular capacity, so limited and local that no inference can be made from one performance to another, even within the same presumable group. . . .

*Note: written in 1923. *Ed.*

Estimation of Acquired Attainments

From a practical standpoint these may be broadly grouped into educational attainments and vocational attainments respectively.

(a) *In the School.* For the teacher one of the most helpful achievements of experimental psychology has been the elaboration of standardized scholastic tests. Simple foot-rules have been scientifically constructed for measuring a child's knowledge of the chief school subjects—reading, spelling, arithmetic, handwriting, drawing, composition, and the like. By the help of such age-scales—those, for example, published by the London County Council—it is now practicable to assign, in the space of a few minutes, his mental level for every branch of the elementary curriculum.

(b) *In an Occupation.* To measure the effects of experience or training in a trade or business is almost as easy as to measure progress in school work. To determine the speed and accuracy with which a typist types, or a shorthand-writer takes down matter in shorthand, all that is needful is, first to construct a simple test on scientific principles, and then to draw up, on the basis of actual experiment, standards of efficiency for work of differing difficulty. Tests for such acquirements are of use chiefly in vocational selection—where, that is to say, an employer desires to pick out for a given job the best in a list of applicants. Vocational guidance, on the other hand—where the adviser picks out for a given child the best of all possible jobs—is a far more intricate task. It demands the measurement, not of attainments, but of the underlying aptitudes. To test capacity is much harder than to test acquired knowledge or skill. This we have already seen. And to determine whether a child is endowed with sufficient intelligence, sufficient finger-dexterity, sufficient quickness in analysing sounds, for it to be worth while to train him as a shorthand-typist, is an infinitely harder affair than to discover whether, once his period of training is over, he has reached the minimum of practical skill that will be expected from an office clerk. Here then is yet another pressing problem for future experimental enquiry. The vocational psychologist must work backward from the measurement of acquired dexterities in every trade to the measurement of the related capacities. At present most tests that he administers hinge upon a blend of both. And, in spite of the theoretical difficulty of disentangling the two psychological components, the methods devised hitherto have already proved their value in factories, in workshops, and in commercial firms. In this country vocational tests have been drawn up, and are now being still further refined, not only for different kinds of clerical work, but also for miners, dressmakers, and the various branches of the engineering trades. The practical results, even in these early stages, are an unquestionable success.

TEMPERAMENT

We have now reached the most delicate portion of every psychological analysis. Hitherto we have been studying the man's intelligence, of which he is not so likely to be ashamed. Now we have to study his character, which he naturally prefers to keep private. . . .

Temperament or character is always more difficult to assess than intelligence. Intellectual qualities are relatively constant. Emotional qualities are evanescent and evasive—hard to seize, and harder still to measure. It is significant to note that, though the idea of temperamental testing is almost as old as that of intelligence-testing, it has seen quite a different career. Everyone has heard of Binet's tests for intelligence. But most of us have forgotten his efforts to measure suggestibility, conscientiousness, and fidelity of report. Of late, renewed endeavours have been made to test the feelings and the will; and of these the most effective are the methods of associative reaction, and the so-called psycho-galvanic reflex. . . .

CONCLUSIONS

Here, then, are the main items in the programme of the mental examiner. Having tested all that he can test, having measured all measurable capacities, having passed in review all available data that throw light upon the rest, the psychologist must in the end bring his mixed materials together in one synoptic survey. He must reconstruct the mind dissected. The most expedient way of doing this is to plot out what is known in this country as a 'psychogram', and elsewhere as a 'mental profile'. The various findings are charted diagrammatically upon some uniform and comprehensive scale. . . .

Where the exigencies of the case demand a speedy assessment, I recommend the practical psychologist to aim chiefly at the so-called 'general factors'. If I were permitted to measure no more than a pair of mental qualities, I should look, first, to the degree of a man's native intelligence—his 'general ability', with which more special capacities are known to be correlated; and, next, to the degree of his native instability—his 'general emotionality', with which his special instincts are apt to be in accord. Were I granted the grace of two or three additional estimates, they would still be of a general type—general physical health, general moral character, and general cultural attainments. . . .

Finally, let me leave the would-be analyst of character with a warning. Individual psychology is not a code of rules and principles to be mastered out of hand in the lecture-room or laboratory. It is not an affair of text-book terminology or of a teachable *technique*. It is the product of worldly experience acting on an inborn interest—an enthusiasm for persons as persons, in the old *nihil alienum* spirit.

THE UNITY OF INDUSTRIAL PSYCHOLOGY

L. S. HEARNshaw

This paper, by a former member of staff of the NIIP who is now Professor of Psychology at the University of Liverpool, was a landmark when first published in 1942 (*Occup. Psychol.*, 16, 43-54): its thesis holds equally true in 1970.

INDUSTRIAL PSYCHOLOGY AS CONCEIVED BY MÜNSTERBERG

IN THE THIRTY YEARS following the publication in 1913 of Münsterberg's book *Psychology and Industrial Efficiency*, industrial psychology was a unity only in aim—the aim of promoting efficiency and contentment in occupational life by means that could broadly be described as psychological. The means adopted were very various—selection techniques, the study of environmental influences, movement study, the diminution of fatigue and boredom, the introduction of suitable incentives, the promotion of morale, and the removal of grievances—to mention only some of the main topics studied by industrial psychologists. Beneath these various lines of activity it was hard to find any theoretical unity, and the standard works have all consisted of a collection of more or less disconnected chapters. Münsterberg was, perhaps, unique in that he did envisage the possibility of a connected science: “. . . detached experiments ought always to point to a connected whole”. But “the time when an exact psychology of business life will be presented as a closed and perfected system lies very far distant.” In his own work Münsterberg contented himself with selecting a few central purposes in business life which could be promoted by applying psychological techniques. The three chief purposes he chose were: first, the selection of the best possible men; secondly, the establishment of the best possible psychological conditions for satisfactory output from work; and thirdly, the influencing of human minds by means of advertising and salesmanship.

To an extent not always realized by industrial psychologists, the main structure of their subject followed closely the plan drawn up by Münsterberg. In the text book, *Psychology for Business and Industry* (Moore 1939), the chapters fall precisely under the three headings of Münsterberg's scheme. The advance is solely in the greater wealth of experimental detail, hardly at all in the general conception or plan. The same applies to most, if not all the general works of the intervening period, though some writers exclude from the contents of their books the topics of advertising and selling, while admitting them to a place within industrial psychology. Thus Muscio (1917) deals with the two chief problems of selecting workers, and constructing good

methods of work; Dæver (1921) speaks of three well-marked groups of problems—problems of the worker, problems of the work, problems of the market; Myers (1926) lists eight main topics, which could be grouped, however, under Münsterberg's three headings; Burt (1929) says that there are three general ways in which psychology contributes to the problems of the business man—the employment problem (selection), industrial efficiency (working conditions), and advertising and selling; finally Viteles (1933), who excludes advertising and selling from the scope of his book, divides his subject into “fitting the worker to the job” and “maintaining fitness at work”. In these and other books on industrial psychology not only do we find an absence of theoretical unity, but sometimes even the denial of the existence of such a unity. Thus Burt writes, “Industrial psychology comprises a number of topics that are somewhat independent, and there appears to be no fundamental, logical principle according to which they must be arranged.”

In this essay I propose to maintain that industrial psychology is a unity—a theoretical, not only a pragmatic, unity; that the failure to recognize this unity springs from a misconception which has persisted from the time of Münsterberg to the present day; and that this is a matter which, far from being of merely academic interest, is one which affects both the outlook and the practical effectiveness of industrial psychologists.

AS A BRANCH OF APPLIED PSYCHOLOGY

For Münsterberg, industrial psychology was a branch of applied psychology, or, as he sometimes preferred to call it, ‘psychotechnics’. He believed that there was a pure psychology, based primarily upon laboratory experimentation, and that this pure science could be applied to various spheres of practical life. This conception has persisted. Myers, with characteristic lucidity, has stated the matter more succinctly than anyone else. “Industrial psychology is an applied science. It is concerned with applying our knowledge of mental processes to the conditions obtaining in modern industry.” Now it would necessarily follow from the conception of industrial psychology as an applied science that it should lack any fundamental unity. We should be wrong even to look for such unity, just as we should be wrong to look for unity in applied mathematics. Mathematics can be applied in many, diverse, unconnected directions; and similarly, industrial psychology, if solely an applied science, would consist of diverse applications of psychology within the industrial field. And this is how, as a matter of fact, it has usually been conceived. It is this idea of industrial psychology as simply a branch of applied psychology that I regard as the misconception which has prevented the realization of the unity of the subject.

AS A STUDY OF INDIVIDUAL DIFFERENCES

Psychology is too general a science to be capable of direct application. “As long as experimental psychology remained essentially a science of mental laws, common to all human beings, an adjustment to the practical demands of daily life could hardly come in question. With such general laws we could

AS A SUB-SCIENCE OF GENERAL PSYCHOLOGY

The way out is through the realization that industrial psychology is not, primarily, applied psychology. Psychology is, perhaps, best defined as the science of human behaviour, and its function as a general, abstract science is to describe the general structure of human behaviour, and to discover its governing principles. But human behaviour in practice falls into several well-marked fields, centering³ round the major institutions of society. The major fields are, perhaps, family life, education, work, recreation, politics, war, art, science, religion; but others could be added to the list. In each of these fields of behaviour the general laws of human behaviour, of course, apply; but in each field there are special laws which derive from the structure of the field in question. Following Mannheim (1940) we may call these special laws *principia media*, defining them with Mannheim, as "those regularities and interconnections which do not operate in every society, but which define the particular character of a certain social pattern." The control of human behaviour in these special fields is not possible merely through an understanding of the generalities of human behaviour; the *principia media* must be understood too. Therefore, for each field of behaviour a special theoretical branch of psychology is needed. This essentially is what industrial psychology is. It is not applied psychology, but a sub-branch of psychology, and may be defined as the science of behaviour at work. In particular, of course, it is the science of behaviour at work in the environment of the modern industrial concern, but theoretically it could be regarded as the study of any work behaviour. If we want a parallel to the relationship between psychology and industrial psychology we can easily find it among the biological sciences, where there are, in addition to the general science of biology, numerous sub-sciences, such as entomology, ichthyology, helminthology, etc., or divided rather differently, physiology, histology, endocrinology, etc. In all these sub-sciences the general principles of biology obtain, but within each field there are special features which demarcate it from the general field of biology.

In the same way psychology is the general science of behaviour; industrial psychology, educational psychology, religious psychology, etc., are sub-sciences within the general science. It is not, of course, intended to regard these fields as absolutely distinct and unrelated, but only as sufficiently distinct to necessitate specialized treatment.

From this conception of industrial psychology, not as applied psychology, but as a sub-science within psychology, several consequences follow. In the first place, industrial psychology is primarily a theoretical science. Its chief aim is not to discover the best possible human conditions in occupational life, but simply to understand human behaviour at work. Calling it theoretical naturally does not imply that it is non-experimental, but that it is concerned with understanding conditions and building up a body of scientific knowledge. In the second place, industrial psychology, as primarily a theoretical science, must have some sort of unity; otherwise there would be no justification in demarcating it and giving it a separate name. These statements raise two questions: first, how are we to conceive industrial psychology as a unity? second, how is this conception related to, and how will it influence, the activities of industrial psychologists?

AS THE SCIENCE OF BEHAVIOUR AT WORK

The subject matter of industrial psychology is behaviour at work. It is not concerned with the problems falling under Münsterberg's third heading—the psychological factors influencing the sale of products, which fall under a different branch of psychology. There is no essential connection between the problems of industrial psychology proper and the problems of marketing. These two sets of problems relate to human behaviour in two different fields, production and consumption, and should be kept distinct. The inclusion of marketing problems in industrial psychology usually appears to have made industrial psychologists uncomfortable, because though frequently mentioned as one of their concerns, it is still more frequently ignored. Thus neither Muscio, Myers, Burt, nor Viteles give it a place in their books. Nor has it received any attention from the Industrial Health Research Board. Here, as in other ways, the unexpressed intuitions of industrial psychologists have often been sounder than their declared programme; and they have done well to exclude a set of problems which have no logical connection with the main field of industrial psychology.

AS A UNIFIED THEORETICAL SCIENCE

But when this irrelevant set of problems is excluded, industrial psychology is essentially a unity, as the science of behaviour at work, and the industrial psychologist is studying not independent and unrelated problems, as the plan of his text books would suggest, but various factors which influence work behaviour, and in influencing it, interact with each other. Work behaviour, of course, is a complex whole, comprising various aspects—subjective aspects, such as contentment and discontent, and objective aspects, such as output, the achievement of quality, accidents, and so on. The indus-

trial psychologist may be interested in any given inquiry in one or other of these aspects, but each aspect is only an abstraction from the totality of work behaviour. In any case the main object of the industrial psychologist's inquiries is to understand the factors that are influencing that aspect of work behaviour which he has selected for study. These factors can be grouped into four major groups—the physical, the physiological, the psychological, and the social. The physical factors include the physical features of the spatial environment—particularly light, ventilation and noise; and the temporal aspects, or length of the work period. The physiological factors include fatigue, drugs, sickness, physique, posture, and movement. The chief psychological factors are innate abilities, acquired abilities or skills, personality traits, and motivation. The social factors comprise the influence of the immediate working group, the influence of the formal works organization and the supervisory structure, and the influences of the extra-works organizations of employers and employed and of the larger social groups in which the works are situated. To the practising industrial psychologist it may seem no more than a minor terminological change to speak of factors influencing work behaviour instead of problems in work behaviour. But the difference is really an important one, for whereas problems are conceived as independent, factors are necessarily interrelated. Every piece of work behaviour is the resultant of the influence of all these factors, and change in the state of any one factor is liable to affect the influence of any of the others. We can now see more clearly the inadequacies of Münsterberg's stress on individual differences as the foundation of industrial psychology. Industrial psychology studies not only individual, that is psychological, differences, but also differences in all the factors, physical, physiological and social, as well as psychological, that influence work behaviour. And it is primarily a theoretical science which seeks to state in general terms the way in which these various factors interact upon work behaviour. Industrial psychology is not, therefore, a conglomeration of isolated problems, linked only by a common practical aim, but a unified theoretical science.

AS EMBRACING THEORY, RESEARCH AND PRACTICE

How is this conception of industrial psychology related to the actual activities of industrial psychologists? The industrial psychologist is certainly not merely a theoretician; he is also a practitioner. But in his practice, it is becoming increasingly clear, he is applying not psychology but industrial psychology. The progress of industrial psychology has made it more and more obvious that effective changes in the human side of industry can be brought about only on the basis of a sound theoretical industrial psychology, and that pure psychology is only indirectly valuable. The basis of industrial psychology is not laboratory experiments, but researches in the industrial context. It is these researches, the aim of which must be in the first place knowledge and only in the second place application, that have established the science of industrial psychology. This need, to go directly to the industrial context, has been felt, in spite of his profession to be applying psychology,

by the industrial psychologist from the earliest days. The main difference between the industrial psychologist of 1920 and 1940, is that the interconnectedness of the factors influencing work behaviour is now more clearly realized. In particular the monumental series of Western Electric researches, conducted by Elton Mayo, T. N. Whitehead and others, showed the impossibility of ignoring the complex inter-relationships of physical, physiological, psychological and social factors influencing behaviour in the work situation.

THE POSITION OF VOCATIONAL PSYCHOLOGY

No mention has so far been made of the techniques of vocational selection and guidance, which are certainly integral parts of industrial psychology, although they are the parts which, from Münsterberg onwards, were most generally segregated into a section of their own. From a practical point of view this may seem justifiable since the problems of "fitting the worker to the job" and "maintaining fitness at work", to use the terminology of Viteles, appear to be two distinct problems. But from the theoretical point of view the personal qualities which the vocational psychologist studies are merely factors influencing work behaviour. It is quite legitimate for the vocational psychologist to abstract these factors for special study, but it is well for him to remember that they are not isolated and unrelated. It is because these factors are only some of the factors that influence work behaviour that the vocational psychologist cannot make more than very partial predictions. The correlation between tests and estimates on the one hand and work performance on the other is always well below unity. Moreover, because the vocational psychologist has often attended exclusively to these factors his work has often been undone: his placements may have been made correctly from the point of view of personal qualities, but various factors in the working environment, particularly perhaps social factors, have prevented satisfactory adjustment. Hence the desirability of envisaging industrial psychology as a whole.

There is one other point in connection with vocational selection and guidance that is important. Industrial psychology is in the first place a theoretical science, and, therefore, the basis of the techniques of vocational guidance and selection is also theoretical; and, as in every other branch of industrial psychology, the vocational psychologist depends upon a special theoretical discipline rather than upon pure psychology. The theoretical basis of vocational psychology is occupational analysis and the validation of testing and other techniques. It is only on the basis of such research that vocational selection and guidance can be effectively carried out. Of course, the vocational psychologist borrows in this work both methods and concepts from pure psychology, but his work is nevertheless largely specialized, and largely concerns occupational aptitudes of no great interest to psychology in general. Thus vocational selection and guidance are based like every other application of industrial psychology on a specialized theoretical discipline, and this discipline is an integral part of a unified industrial psychology, the science of behaviour at work.

PRACTICAL CONCLUSIONS

To the practising industrial psychologist this whole discussion may seem tiresome and academic. It remains to be shown, therefore, that this re-definition of industrial psychology is more than of academic importance and is going to influence the practical effectiveness of industrial psychologists.

First, if the practical work of industrial psychologists is not applied psychology, but applied industrial psychology, there must be an industrial psychology to apply. Industrial psychology can only be built up by research in the industrial context. There have, of course, been many such researches, but there would have been many more if industrial psychologists had not believed that they already had, in psychology, something of immediate applicability. In particular, in the whole field of vocational selection and guidance the basis of accurate occupational knowledge is still quite inadequate.

Secondly, if the practical work of industrial psychologists is not applied psychology, but applied industrial psychology, they must be trained not merely in psychology but also in industrial psychology. There should be a course of at least two years' duration for the training of industrial psychologists in the specialized theoretical discipline of industrial psychology.

Thirdly, a grasp of the nature of industrial psychology, as the science of behaviour at work, must bring an immense increase in clarity and power to the practising industrial psychologist, who has too often cast theoretical considerations to the wind and relied upon clever 'hunches' and 'intuitions'. Burt, for example, states that "any technique or any fundamental approach that will lead him to his practical goal is legitimate. The theoretical problems regarding the underlying basis of human behaviour or human experience are left to other specialists, and the author does not feel that they are germane to the present discussion." This point of view, however, degrades the practising industrial psychologist to the level of the efficiency expert, with the efficiency expert's ruthlessness toned down by a little human sentimentality, and debars him from the status of scientist altogether. The re-definition of industrial psychology restores to the industrial psychologist his intellectual integrity.

Fourthly, the conception of industrial psychology as applied psychology has restricted the vision of industrial psychologists. They have tended to ignore those factors influencing behaviour at work, particularly the social factors, which play no part, or little part, in general experimental psychology. It was only in the 1930s that these factors began to receive the attention they deserve.

Fifthly, the conception of industrial psychology as a unity is of vital importance in planning research, and in interpreting the results of research. Without this conception, to quote the words of Mayo, "one may organize, and apparently scientifically, a carefully contrived inquiry into a human industrial problem and yet fail completely to elucidate the problem in any particular." It is necessary to take into account the interrelatedness of the factors in any industrial research, and, even more, in the application of the results of research from one industrial context to another, where one or more factors may be changed.

Sixthly, this conception of industrial psychology as a unified theoretical science is implied in new developments of the subject, and simply states openly what has been, to a growing extent, tacitly assumed. But it makes greatly for consistency and absence of confusion when theory and practice are in harmony. Hence there is every advantage, as a guide to future developments, in stating clearly the true nature of the subject, and discarding views handed down from the early days of industrial psychology, and now no more than a hindrance.

For these reasons the practising industrial psychologist should welcome, and should be assisted by, this re-definition of industrial psychology. Industrial psychology is not solely an applied science, dealing with specific, disconnected problems: it is in the first place a theoretical science, only afterwards an applied science. Above all, through the multiplicity of the factors which it studies and of the individual contexts with which it deals, there is an underlying unity, the unity of the science which seeks to understand the factors influencing behaviour at work.

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A TECHNIQUE FOR SURVEYING EMPLOYEES' OPINIONS AND ATTITUDES*

WINIFRED RAPHAEL

Mrs Raphael, for many years superintendent of the Institute's Personnel Section, and later Assistant Director, had unique experience in surveying employees' attitudes; during the ten years before this article appeared in 1944, she had interviewed over seven thousand people in twenty-one different factories, offices and stores. She describes here the need for such surveys, the techniques she had developed, and the results obtained.

NEED FOR SURVEYS

A VALUABLE SERVICE to the community which industrial psychologists are peculiarly fitted to perform is the making of surveys of the opinions and attitudes of the employees in any organization, the term 'employee' being used to cover all ranks from senior management to unskilled labourers. These surveys are made by means of confidential interviews; what is said is reported to the senior management; but no names are disclosed, save at the express request of the person being interviewed. Most employees have comments that they would like to bring before their managements; most managements want to hear these comments; and the industrial psychologist can act as a helpful bridge between the two.

It may be thought that such an active measure as a survey is redundant in progressive firms which already have personnel managers, joint production committees, shop stewards and suggestion schemes. But most people, unless they are unusually enthusiastic, have a certain mental inertia which causes them to hesitate before making general comments spontaneously on matters which do not especially affect them. Also many are nervous—even those who appear least so—not only of the management, but also of seeming to interfere with other people's business or of being dubbed a grumbler. It is not until employees are directly asked for their suggestions or complaints that the wealth of potential information and neglected experience lying hidden in every industrial organization is disclosed.

Psychologists from outside the Company, with long and varied industrial experience, can undertake these interviews in a way that is impossible for the Company's own staff. In the first place, employees naturally feel freer to talk to an impartial outsider with the promise of their conversation being reported anonymously and with no chance of repercussions that might

*Reprinted from *Occup. Psychol.* 1944, 18, 165-173. One of a collection of essays by members of the staff of NIIP presented to Dr Myers on the Institute's 21st Anniversary.

affect their position. Secondly, an interviewer from outside with a fresh outlook necessarily receives a more vivid impression of conditions, and thus can observe what members of the management may miss because they are too familiar with it. Thirdly, an industrial psychologist has an unusually wide experience on which to base standards. And lastly, psychological training helps in the discipline of conducting interviews so that a fluent expression of opinion is obtained with neither prompting nor comment from the interviewer.

The need for these surveys is especially obvious in large companies whose size and complexity make it impossible to maintain direct contact between the senior management and the junior grades of workers. But very fruitful results are also obtained from interviews in quite small firms with eighty employees or less. Here the very intimacy that exists often encourages restraints and jealousies which militate against the free and honest expression of ideas.

PRELIMINARIES TO THE SURVEY

For such a survey to be successful it must be conducted with the full confidence and understanding of all ranks in the works. Therefore the psychologist's first step is to give an explanation of the purpose and method of the survey to meetings of management and of the works council.

It is often wise to start by interviewing people of at least medium seniority, perhaps foremen or office supervisors. Sometimes it is possible to speak to these in a group, outlining the procedure to be followed, but in any case a personal letter signed by the highest active member of the management (managing director, general manager, or works director) should be sent to everyone who will be interviewed, in some such terms as these:

"In order to improve our Organization I am asking for your co-operation in giving suggestions and criticisms on any matter connected with the Company such as efficiency, organization, working conditions, pay, hours, welfare, canteen, etc., etc.

"To encourage people to be perfectly frank I have asked _____ from _____ to hold this inquiry for me, who will hold private interviews with all managers and with representatives of the works and office staff. The matter of what is said will be reported to me, but no names will be mentioned (unless the person making the suggestion requests it), and the report will be arranged so that names cannot be inferred.

"Please make notes in advance of any suggestions that you wish to discuss, including those that you may have previously raised."

The letter sent to 'clock' workers is similar to the above, except that assurance is given that they will lose no pay by attending the interview.

Appointments are made for each interview, preferably at least a day ahead. The length of time that an interview lasts depends entirely on the person being interviewed; it may range from ten minutes even to five hours. Rough averages for planning appointments are: managers one-and-a-half

hours; foremen and shop stewards one hour; male operators half-an-hour; female operators quarter-of-an-hour. If any interview seems likely to exceed the time allowed, a second and, if necessary, longer appointment is made: there must never be any feeling of hurry.

CONDUCTING THE INTERVIEW

The interviews are held in a quiet private office in a convenient position in the Works with an entrance not overlooked by large numbers of people. It is important to have a friendly and informal atmosphere: comfortable chairs should be provided and smoking permitted. The interview is best initiated in some such terms as these: "I expect that you find this a satisfactory firm to work for on the whole, but nowhere is perfect. The directors want you to help the Company by giving suggestions about anything that can be improved, whether it is concerned with your work, with the firm in general, or with your own conditions. All that you say will be reported to the management, but your name will not be mentioned unless you ask that it should be." Then the interviewer waits for spontaneous comments. He never asks specific questions except to clarify or to amplify information already given. Most employees come with a long list of suggestions or complaints. But if a person is slow in starting, he can often be stimulated by some such remark as "When you are at home of an evening, don't you sometimes say, 'They ought to do something about this'? Now about what do you say that?" or "Suppose you were suddenly put in charge here, what changes would you make?" With such encouragement very few—perhaps two per cent—fail to raise *some* interesting points for discussion.

Of course, the employees are generally interviewed singly, but occasionally a girl likes coming with a friend, or a man and his mate may ask if they may be seen together.

The skill of the interview lies in quickly establishing such confidence that fundamental matters are freely discussed, and in stimulating conversation without giving any suggestions as to the direction it should take.

The content of what is said is of course important; but the manner in which it is said and the emotion lying behind it are often even more revealing. Statements cannot always be taken at their face value, and often by judicious interviewing a torrent of feeling is unleashed. Thus important light may be thrown, say, on matters of supervision or of interdepartmental co-operation. The very expression of this pent-up feeling is of direct help to its relief. Once the emotion has been put into words, the person's face often 'lightens'—in a sense, by speaking of the matter he has 'put it behind him'. Often he is conscious of this. "Ah! I feel better for having been able to say that," he may say.

Care must be taken in making a report to the management to be just as punctilious about describing emotional reactions as actual speech. Throughout, the spirit of the promise of anonymity must be kept as well as the letter. It would indeed be a professional tragedy if these inquiries came to be considered as a sort of *gestapo*!

The proportion of people in a company to be interviewed will obviously vary according to its size. In a small firm of a hundred or two hundred employees everyone will be invited—and the great majority will come. In a larger firm of up to two thousand it may be advisable to interview all the management and works staff, most of the office staff, and a certain proportion of the hourly-paid workers, chosen by length of service, on the recommendation of the shop stewards, or because of their own wish to be interviewed. In very large organizations, it is sometimes better to start with a certain grade, such as all foremen, or to concentrate on a section where there has been difficulty or discontent, indicated perhaps by a high labour wastage or by absenteeism. The whole technique is so elastic that it is impossible to generalize about its application. On the whole, it is better to start with a small programme and to extend it as it succeeds, than to plan a large project from the start. Sometimes one series of interviews leaves the management with so many suggestions to consider and innovations to make that it is well to have a few months' interval before interviewing the next group.

As many of the suggestions are on technical matters it is essential that the interviewer should have wide industrial knowledge, not necessarily about specific processes (though that is useful), but especially about central departments affecting others, such as planning, production control, costing, transport, inspection, etc.; also the interviewer should be familiar with the payment system, the personnel organization and relevant government orders and company rules.

RECORDING THE INTERVIEW

Notes are taken quite openly; each point as it is raised is entered separately, and if it is complicated the entry is read out to the person making the suggestion. Assurance is given to nervous people that the notes are always kept under lock and key, and it is important to observe these conditions carefully. If an employee gives a concrete suggestion which may earn a reward, he is asked whether he would like his name mentioned in connection with it.

It is convenient to summarize the comments of a group of between seventy and two hundred interviewees. The latter should have some unity of interest, such as, for instance, would arise from all being members of management or all members of the same department.

Main headings are chosen according to the subject matters most frequently raised. These will vary; but, for example, might be—organization, efficiency, working conditions, supervision, training, pay, hours and holidays, personnel and welfare, canteen.

Under each heading a summary of the general attitude is given and then the individual suggestions are listed roughly in the order of their importance. All the various points raised are reported even if they are not based on fact, for misconceptions are also of significance, both in themselves and because they may need to be refuted. An indication is given of the relative frequency with which each point is raised by a system of asterisks, *** against

a suggestion showing that it was frequently mentioned, ** that it was mentioned by several people, * that it was given only by two or three, and the absence of an asterisk indicating that only one person made the suggestion.

It is difficult to give a typical section of a report, for often the most interesting and useful points are those specific to the firm itself, but a part of a rather 'watered down' imaginary section on "Supervision and Promotion" is shown here.

Some of the supervisory staff feel that the 'big five' make all the decisions in the Company and that consequently they are departmental chiefs in name only and have no executive power. Several said that they had many ideas to offer the Company but never had a chance of expressing them—less chance indeed than the operators who have their production committee. They wished that they could be in closer touch with the senior management so that they could hear of proposed alterations in advance and comment on them.

A better system is desired for promotion within the Company, both from operators to foremen, and also to managerial positions.

Good co-operation seems to exist between the various managers and foremen in B Block, but in D Block there is evidence of cut-throat competition.

<i>Suggestion</i>	<i>Action</i>	<i>Date on which Action is taken</i>
*** 1. <i>Management Meetings.</i> Regular meetings should be held weekly or fortnightly for managers to discuss and arrange interdepartmental matters. This would save time for directors and managers and would promote co-operation. Occasionally joint meetings should be held between works and office managers on common problems.		
** 2. <i>Technical Club.</i> This should be formed to meet monthly (out of works time) and lectures, given both from within the Company and by experts from outside, should be arranged.		
** 3. <i>Promotion.</i> Vacant jobs should be posted up on the staff notice-board, inviting applications from within.		
* 4. <i>Register of Qualifications.</i> A staff register should be kept for each individual, on which should be entered qualifications at time of entry, and additional qualifications as they are obtained, including membership of professional associations, etc.		
* 5. <i>Second in Department.</i> There should be a recognized second in all departments, in case the foreman is away, not necessarily a charge hand, e.g. Depts. 4, 7 and 14 have no 'second'.		
6. <i>Potential Office Executives.</i> Opportunities should be given for working in several departments.		
7. <i>Day and Night Foremen</i> of the same department should meet at least weekly, preferably with the manager present. This is now left to individual initiative.		
8. <i>Production Control.</i> Section leaders should rank as staff; now four do and four do not.		

RESULTS

The subject matter of the suggestions varies so enormously from company to company that it is impossible to generalize. In one much of it may be coloured by lack of co-operation between departments, in another by adverse working conditions due to old ill-adapted buildings or by an unpopular distribution of working hours; a third may suffer from the absence of a personnel department or of an efficient system for production control, and a fourth may have a dictator instead of a director.

Also, of course, the subject matter will vary according to the degree of seniority of the group that has been interviewed—operators will tend to deal with specific points and senior management with more general matters. It is interesting to realize that sometimes even directors are grateful for the opportunity that the interviews give them for expressing their own opinions. When it is realized that some managing directors are considered unapproachable by the other directors, it can be seen how necessary it is to offer other ranks a ready channel.

Below are given a few actual examples of the number of different suggestions given by various groups. (A suggestion is counted as 'different' if no one has previously given it from that group.) These all come from excellently organized companies, with good employer-employee relations. They show how much information can be obtained from very satisfactory firms.

Topic				<i>Large Engineering Works, 91 Super- intendents and foremen interviewed</i>	<i>Medium-sized Steel Works 106 works staff and operators interviewed</i>	<i>Office 83 staff interviewed</i>
Organization	..	..	..	39	42	} 31
Efficiency	..	..	..	78	69	
Working conditions	..	..	..	25	22	12
Supervision	..	..	..	15	6	11
Training	..	..	..	16	6	4
Pay	..	..	..	24	25	8
Hours and holidays	..	..	..	11	13	8
Personnel and welfare	..	..	..	24	17	3
Canteen	..	..	..	13	24	7
TOTAL	..	..	..	245	224	84
Average per head	..	..	..	2.7	2.1	1.1

These are typical and it is interesting to notice that in each case about two-thirds of the suggestions are on matters which will increase the company's efficiency, and only one-third are for the direct personal benefit of the individual. When an employee is conscious of a matter that affects him, his comfort or his pay, this is, of course, brought forward, but the results show what a wide flow of interest is directed towards the organization and efficiency of the company of which he is a responsible and interested member. Ways of improving present unsatisfactory methods of manufacture are mentioned with great frequency.

The actual suggestions are only a part of the information gained. From the intimate discussions between interviewer and interviewee on all the aspects of the company's activities, impressions are obtained of many attitudes and problems, of the presence or absence of co-operation, of the quality of supervision, of the loyalty and the discontent. Hopes and fears are disclosed and the whole of that complex network of human effort, ambition, fulfilment, frustration and disappointment that makes up every firm is disclosed as by no other method.

Both suggestions and attitudes should be honestly and fully reported to the senior management. Unless the latter are prepared to face the truth, including possible criticism of themselves, the investigation loses its integrity and most of its value.

ACTION

The purpose in making a survey of employee-attitude is not merely for the academic interest of obtaining results, nor just to provide a relief valve for the feelings of the employees—though such a 'mental letting down of the back hair' is so important that in some similar investigations in the United States this purpose has been considered paramount. So much valuable information is given by the pooled suggestions that if the firm does not make full and prompt use of it, important opportunities are lost, and resentment is felt by employees who have been interviewed and find that their comments are all ignored.

As a stimulus to prompt action, space is left in the report (see above specimen) after each suggestion, for 'Action' and 'Date on which action is taken'. The quality of the suggestions is such that many companies find that it needs a management committee to study the list and to make recommendations on their introduction. The proportion found practicable varies widely, but it is disappointing if useful action cannot be taken on at least one half of the suggestions.

It is impossible to assess in numerical terms the increased harmony and loyalty that follow the adoption of the suggestions; but, for example, it is interesting to note, in one office of over a thousand clerks, that the previous high labour-wastage was halved after such a survey had been made and acted upon. Indeed, pre-war, it was frequently possible to find the date of a survey by looking for a significant and sudden drop in the labour-wastage charts.

Surveys of employee opinion and attitude are satisfying alike for psychologist, management and workers. The psychologist gains, as he could in no other way, an intimate insight and understanding of the human problems, the personal incentives and deterrents, the satisfactions and disappointments that lie behind modern industry. The senior management, by receiving the frank opinion of all ranks, are given much information that is valuable directly, and also a useful indication of general and departmental morale. In every business those at the top, by virtue of their seniority, are sometimes the last to know of many important psychological problems that

are in need of solution. It is true that without such a survey existing frustration may result 'in the long run' in some hints reaching the higher management. But these often come by such underground channels that the management cannot feel it proper to investigate or act on what has reached them. With a survey, on the other hand, they have a happy, honest means of gaining this information.

* Perhaps the employees are the group most grateful for the investigation, for it offers them an unparalleled opportunity for giving expression to those many suggestions and grievances which are not suitable for presentation through trade unions, production committees, suggestion schemes, etc., either because of the nature of the matter suggested, or because of lack of self-confidence or economic fear. Invariably the response to these interviews is very co-operative—employees sometimes returning two or three times with fresh ideas. Many say how grateful they are for the opportunity to discuss, without disloyalty to the company, matters which had long been on their minds. As one employee put it, "I've been dreaming of these things for years". It is not merely that the employees experience relief in expressing their feelings, but that the request for their assistance enables them to identify themselves more closely with their company by taking a constructive part in its organization and thus to gain the interest and responsibility that are their due.

SATISFACTIONS IN WORK

NIGEL BALCHIN

The author, a member of the Institute's staff in the early 'thirties, was for the greater part of World War II concerned with army problems of personnel selection and operational research, and became Deputy Scientific Adviser to the Army Council. He died in 1970. This article is reprinted from *Occup. Psychol.*, 1947, 21, 125-134.

IF WE LOOK BACK over the history of industry in this country we can distinguish at least three fairly clear-cut phases in the attitude towards work.

Firstly, in the days before the Industrial Revolution, work was largely agricultural. The attitude then was the attitude of the farmer or farm labourer who worked long hours, and often did a very exhausting job, but whose work was varied, in a long cycle, and directly and obviously purposeful. Heaven forbid that I should sentimentalize about the jolly ploughboy, but I do suggest that this type of work has about it something fundamentally satisfying. Its economic results may be far from satisfying. It may be hard and poorly paid. But as far as the work itself goes, I think you will find that even today the agricultural worker tends to be acutely interested in the complication of his job, and I think he probably always has been. If one goes back even as far as Langland's *Piers Plowman* one finds, beneath all the complaints of the hardness of a ploughman's lot, this odd pride and satisfaction in the direct struggle between man and nature, and in using a certain skill and knowledge to produce something of obvious tangible value.

Secondly, with industrialism came the less varied job, the shorter cycle of operations and the loss of craft satisfaction. Industrialism took over from agriculture the idea of long hours and exhausting effort. What it did not take over was the instinctive satisfactoriness of the job. For it substituted for the natural struggle against nature a purely artificial struggle against a certain type of economic organization. The relationship of a man's work to his own basic requirements became much more distant, and work, therefore, became much more detached from the rest of life. Work was still necessary because unless a man worked he could not live. But the relationship of work and life was no longer simple; it involved a huge and immensely complicated economic machinery. Instead of growing something and then eating it, a man began to carry out one process towards the making of one part towards the making of a complicated article, which when sold yielded somebody else enough money to pay him, money with which to buy food.

The badness of this exchange was recognized by William Morris. But Morris, though a Socialist, possessed, like many another Socialist, an

essentially conservative mind, and his remedy was the typical conservative remedy. He liked sunshine, so he strove gallantly to make yesterday's sun rise again, instead of looking towards tomorrow's. Morris preached the satisfaction of simple craftsmanship, without realizing that those who find real satisfaction in craftsmanship are and always have been a small minority; and that of the old craftsmen whom we so much admire about ninety-five per cent were very bad craftsmen who would have been a great deal happier if they had been modern factory operatives. If anybody doubts this, let him look at samples of old hand craftsmanship not in isolated pieces in museums, but in bulk, and he will see the cheating and the boredom and the hatred of the whole thing written all over many of them. Let us face the fact that the pure creative joy of hand craftsmanship is no more a satisfaction of universal application than painting pictures or writing books and certainly not one for which the majority of people would exchange a high material standard of life.

Yet even in the bad old industrialism against which Morris fought his losing fight, there was a certain satisfaction, if an odd one. When we marvel at the tenacity and endurance and energy of those old workpeople, and wonder how they stuck it, we tend to underestimate the fierce masochistic pleasure of the struggle (and largely a losing struggle) against the forces of their world. Recollect, the poor had no political power and no organization. The individual was alone against the world. And in that struggle to wrest even a bare living from the world there was still something, at least, of the earlier workers' satisfaction in wresting a living from nature—of taking on something enormously powerful, and if not defeating it, refusing to surrender to it. I hold no brief for those days. But we are talking about satisfactions, not justice or equity. Nobody who has met survivors from the bad old days of industry can doubt the pride and satisfaction that come from the mere process of survival, in the days when survival was not easy. Moreover (and this is vitally important) those were days of deep and simple religious conviction. To many people, this life was simply a short period of preparation for eternity. There is not that desperate sense of the flight of time and opportunity that we have today. Happiness—real happiness—was a thing which was to come; not today or next week, but when this world had been left behind.

Thirdly, we come to modern industrialism, and with it three great developments. The political power and organization of the worker increased the decay of religious faith—whereby happiness and satisfactions in this world came to be regarded as the only happiness and satisfaction the individual would ever know, so that his fate was in his own hands to a greater extent than it had ever been; modern management, guided by science, began to see the importance of better working conditions; labour and management together set out coolly and rationally to destroy the old sadistic-masochistic pleasure in effort and discomfort for their own sakes, and to make the point that there was no virtue in hard work for its own sake—that effectiveness was all. That is the great development of the last fifty years—the policy summed up in making work less unpleasant.

But note—however desirably, there is another satisfaction gone. Just as the old industrialism took away the satisfaction of the struggle with nature,

so modern industrialism and political development has taken away the irrational masochistic pleasure of the individual struggle against a hostile world. In this country we are rapidly reaching the stage where the workman is not struggling with nature or with the economic organization of his world, but with himself and his own desires and his own organizations. The size of the incentive he is offered is not survival but the capacity to buy a new radio set. Apart from that it is all negatives. It shall all be quite easy and not very unpleasant and anyhow there shall only be forty hours of it a week, and if he does get dirty, he shall have a nice bath after it . . . and so on. We say, in effect, "Look, we know this is a lousy job and that you don't want to do it. But we'll do our best to make it as tolerable as we can."

The average man works for some forty-five years. Even with modern hours he spends the best hours of his waking life at work. If we are not going to make his very existence dependent on work, we must give him something more than these colourless apologetic negatives, or within a very few years he is going to say, "This is unreasonable, I have only one life to live. Why should I spend the best part of it in factories and mines? They may be air-conditioned, but I don't want to be in them. The work may be light, but I don't want to do it. I won't sell my life for a new radio set. You can go and climb a tree."

I make this point because it seems to me that whilst all the work on conditions and reductions of fatigue and so on is entirely admirable, it is now essentially out of date. It removes some of the resistances to work, but it provides no positive incentive or satisfaction. It assumes the existence of the economic incentive. And if the economic incentive is removed or greatly weakened, it becomes a palliative for a disease that no longer exists.

It therefore seems to me that we must go back to first principles and ask ourselves, "What are the positive satisfactions that can be gained from work?" Simply expressed, a man may work because he must, or because he should, or because he wants to. In the first instance his satisfaction lies in escaping the results of not working. In the second he has the satisfaction of duty fulfilled. In the third he has satisfaction in the pleasure of work for its own sake. How far are these three applicable to the future?

In the past the basis of most work has been a force—nature or economic pressure—which obliged a man to work or starve. Much of his satisfaction, as I suggested, has been from successfully combating it. Nowadays we are moving towards the abolition of those forces. It will probably be urged that the desire for a higher standard of life will still provide a categorical imperative, without the threat of starvation. To some extent, and for some time, this may be so. But I cannot help feeling that the force of the categorical imperative is now fatally weakened. There is a world of difference between saying "He who does not work shall not eat" and "He who does not work shall not have a radio or a refrigerator." All experience suggests that beyond a certain quite early stage the promise of higher wages for higher effort brings diminishing returns. The average worker on piece rates sets himself a standard of effort well within his capacity, which will bring him a certain wage, and except for some definite purpose he will not exert himself further

to earn. Like a rational man, he realizes that money can cost more than its worth. The classical example of this attitude is the miner who was brought before a recent minister of mines as a persistent absentee. The minister said, "They tell me you work four days a week. Why is that?" The miner replied, "Because I find I can't earn what I want in three." If we assume that a man works because he must, we shall often get this reply and it will be a fair and logical one. However much we approve of discarding the whip of economic pressure, it would be foolish to shut our eyes to the fact that, when society discards it, it discards the biggest single incentive to effort so far discovered.

Can we therefore go over, as the idealists suggest, to 'should' as an incentive and satisfaction? To a community in which people work because they believe it their duty to society to do so, and find satisfaction in doing this duty? I don't want to be a cynic, but frankly, I don't believe it. It may just be that my experience of people is faulty, but I do not believe most men will work hard for anything as abstract as society. They will work hard for themselves and their families and their friends or for anything that can be seen and personified and loved. But not for an abstraction like society. It is too cold, too distant, too big to be a conscious incentive and too new and artificial to be an instinctive one. We have not yet reached the stage of education in which social feeling has the power of, say, family feeling. We have not been living in big groups long enough for that. To illustrate my point, there could scarcely be a time in which society's need of the individual's effort would be greater than it is in England today. Yet we all know that the standard of individual effort is very low. It may be possible over many years to breed a race which feels (or at least expresses) a keen sense of duty towards society. But we are a long way from it at present.

We are left, therefore, with only one possibility—that men should work because they want to and find satisfaction in the work itself. How? We have already agreed that the William Morris solutions—the solution by which every man is a craftsman—a creative artist in miniature—falls down both on practical grounds and on the grounds of human nature. I do not underestimate the satisfaction that may come from the use of skill. But the whole trend of industry is away from the reliance on widespread skill at the point of manufacture. Skill and thought are becoming more and more centralized in the few who design machines and goods and methods. Even if the desire to acquire and use skill is universal (and I have questioned whether it is anything like as deep and universal as is often supposed) the opportunity for the use of skill in modern industry is strictly limited.

I suggest, therefore, that we are driven to the ultimate step—that, instead of merely making work easier or less unpleasant, we should abolish it altogether. By this I mean that we should arrange for work to merge into the human activities, so that it ceases to be a separate concept and yields at least as much satisfaction as any other part of life—that we should seek to eliminate those factors which distinguish work from pleasure.

There is nothing fantastic in this idea. Many people have already achieved this position. Your artist—your scientist—your doctor—your

author—many business men—get as much satisfaction from their work, if not more, than they get from any other activity. I met a man the other day, a very energetic and successful person, who claimed that he had never done a day's work in his life, in the sense that he had never done anything which he had not enjoyed and found supremely satisfactory. It is a fact that if the necessity of earning a living were abolished tomorrow, very few people would do nothing, or even exert themselves less. They would merely do other things. The problem is to employ this vast, willing fund of human energy in ways which are at once satisfying and productive.

I shall probably be told that this is all very well, but that what most people want is to amuse themselves at the cinema and the dogs, which are essentially unproductive activities. But this is exactly my point. Those who cater for amusement, since they charge people to come in and do not pay them to do so, have been obliged to find out what people want to do. Whereas industry, since economic pressure forced people to come to it, has never been obliged, and has therefore never bothered, to do so. What I am suggesting is that the drastic weakening of the economic incentive has changed industry's position from that of a buyer, who needs nothing but the ability to pay, to a seller, who has to persuade and attract and satisfy. The process is already well under way when every seller's device of advertising is being used to recruit labour for certain vital industries. It is a matter of common sense that in a condition of full employment an industry that cannot sell itself will not get labour. All I am suggesting is that the seller will not only have to advertise, but will have to be sure that the goods are what people want to buy.

In this connection I suggest that the public taste in entertainment is a vital starting point for research. The great popular entertainments represent things which people want to do—that they will even pay to do. Why? What are the characteristics which they find attractive, and how could these characteristics be introduced into work? To take a simple example—the enormous energy and enthusiasm shown by the supporters of professional football teams. Here, for example, we have the appeal of personalities, of competition, of rapid movement, of appreciation of technical skill, of drama and excitement. We have the showmanship of jerseys and colours. Who has ever consciously tried to introduce these things into a factory? And why not—except the feeling that 'work' is a grim and sorry business and that to introduce emotion and excitement into it would be like dancing in church?

Take again the many ramifications of the sexual instinct which are at the root of many popular entertainments. The provider of entertainment has taken the sexual instinct and used it in scores of ways because he knows its power. I have never heard of an industrialist who saw, in the every-day relationships between his male and female employees, or the very fact that he had male and female employees, a tremendous potential source of energy. I make anyone who wants it a present of the preparatory school joke possibilities of this idea. But those who saw mixed A.A. batteries working during the war will have noticed that the influence of the sexual instinct goes a good

deal deeper than its silk-stockings-and-chorus-girls manifestations, and is worth adult consideration in its effect on work.

Again, though we tend to think of soldiers as monumentally old-fashioned and stupid, I suggest that industry might well take a leaf out of the book of the good fighting commander. He is seldom a very subtle psychologist, but at least he realizes that men will not do what he has to ask them to do for their army pay and food—that they must be emotionally stirred and enthused and that his worst enemies are not the opposing Army, but boredom, apathy and the sense of futility.

You will see that what I am urging in a nutshell is that work, as most people know it at present, makes practically no use of the emotional element—and it is the emotional rather than the physical or intellectual elements which provide the part of life which is worth living and the part which most of us live for. I have been in a factory workroom containing five hundred young girls—most of them under thirty. There they were, under 'perfect working conditions', light, warm, clean, comfortable. The conditions were so perfect that it might have been a model cowhouse. Perfect working conditions—but what appalling living conditions! They were young girls and outside their jobs they lived for colour and excitement and drama and change—for emotion. Yet there they sat, for eight hours a day, in that sterile place, from which everything they really cared for had been carefully left out. I often wonder whether our factories and offices—even the best of them—are not organized by people who hate the human race, and deliberately set out to make people's working lives as deadly dull as possible. Is it really beyond the wit of man to approach the problem of employing those five hundred girls from a new standpoint—from the standpoint that unless they are happy and amused and interested—unless they are doing something they like instead of merely earning their livings—they will not work at reasonable pressure? Is it not possible to say that, if there is a job in the place which is so dull that no human being could or does like it, we will scrap that job and face up to the difficulties which scrapping it may create, whatever they may be? Is it fantastic to suggest bright and amusing working clothes and group competitions in production, and really cleverly staged exhibitions of skill and all the standard recipes for inducing group loyalties and team enthusiasms? Would it be sacrilege to ask whether a man might sometimes get better results as overseer of a group of girls than a sour, elderly spinster? Would it not be worth while to use at least as much care and thought in attracting people to their work as is taken in attracting them to a club? In short, is it impossible to make the working life a life worth living in itself, instead of a mere impression of life? I am absolutely sure that it is the negation of life at work that sends people in millions to the over-compensations of the cinema and the races. We criticize this craving for pleasure and excitement. We probably point out smugly that we manage without these things. Yet we create that craving when we condemn people to complete emotional starvation in their working lives.

Again, we not only criticize the craving for amusement but the form it takes—the fact that people don't want to do things but to watch other people

doing them. We say that the nation suffers from 'spectatoritis'. But spectatoritis is not a disease but a symptom—a symptom of the desire to escape quietly from the dark, unsatisfactory existence and to identify oneself with somebody else whose life is more colourful.

What do we expect these people to do? They spend eight hours in a factory starved of every form of material satisfaction. Is it surprising that when they come out they want huge meals of over-rich excitement and emotion put on the table ready cooked for them? All of us who work in the fantasy-producing industry—the film makers and novel writers and professional amusers—are simply paid to live these people's emotional lives for them—the lives they have not the time and opportunity to live for themselves.

I realize that what I am urging is wide open to accidental, and even more open to deliberate, misunderstanding. Let me make myself clear. I am not suggesting that work should be exactly like a visit to the cinema or the dog track. On the contrary, I am suggesting that it should be something infinitely more pleasurable and more satisfying—a pleasant reality rather than a mere escape from reality. I am suggesting that an effort should be made to give the average man what many of us already enjoy—a job which is not merely a means of 'earning a living', but which has in it all the best ingredients of life itself. And to do that we have to scrap all our lingering prejudices about work as 'a dull, colourless, drab, impersonal, unemotional business, and bring into it all the good things that people enjoy, from wherever we may find them. "Why should the Devil have all the good tunes?" asked Luther, when they accused him of setting hymns to the music of drinking songs. Why should the professional pleasure providers have a monopoly of the emotional satisfactions?

The question to my mind is not whether it should be done but whether it can be done. Of course, the primary difficulty in making working a pleasurable activity is that work, to be effective, involves a certain degree of regularity, whilst it is one of the characteristics of pleasures that one indulges in them when one pleases. Let us agree that this is a difficulty. But I see no reason why it should be an insuperable one. On the one hand, if a person is really keen on a certain type of activity, the fact that it involves regular work will not, as a rule, be any great obstacle. It is no obstacle to those who already find satisfaction in their work. On the other, I think those who already find satisfaction in their work. On the other, I think those who already find satisfaction in their work. On the other, I think those who already find satisfaction in their work. Management prefers to keep people on a single, simple, heartbreakingly monotonous job, because it makes management's job easier, and because, traditionally, it produces higher efficiency. But there is at least a *prima facie* case for suggesting that the gain in willing effort from change of occupation will more than offset loss of efficiency, just as shorter hours sometimes yield higher output.

I do not wish to conceal, however, that what I am suggesting is extraordinarily difficult. In fact it amounts to nothing less than a revolution in our attitude towards the organization of industry. The present trend is still all towards the increase of efficiency, no matter by what means, making possible the reduction of working hours and the increase of leisure.

In other words we are still accepting that work is and always will be distasteful and that the answer must be to do as little of it as possible and to get our satisfaction from the rest of life. What I am urging is that instead we should seek to destroy the concept of 'work' as a thing apart from the rest of life. And this would involve us not only in making work less unpleasant but in the much bigger job of making it positively pleasant. In particular such a move will make great demands on management. It will make demands on its imagination, its ability to plan, and its knowledge of human beings. Above all it will make great demands on its tolerance and goodwill. I imagine that many of us who are concerned with the management side of industry will have great difficulty in swallowing the change in management position—the change from the position of buyer to that of seller. We shall feel that it is absurd and intolerable that people should not only demand wages but imaginative effort on our part, and we shall be tempted to mutter that what is wanted is a good dose of unemployment to bring people to heel and get these grand ideas out of their heads. I do not want to discuss the ethics or the politics of such an attitude. Instead I merely want to express a belief about the future, quite apart from any question of whether I think it is good or bad.

I believe that the days when we could buy large parts of the lives of other human beings for a little money and nothing else are passing. We are reaching a stage where neither management nor society will be in a position to demand from any man work which is not enjoyable or satisfactory. This may well mean that society may have to do without some jobs that it has been able to get people to do in the past. If no member of society is willing to hew coal, then there are only two possibilities—society must do without coal or some men must be slaves. In civilizations of the past, the answer has always been that some men were slaves. We may be moving now towards a civilization in which there will be no slaves and no effective incentive but the internal one of willingness and satisfaction in work. Whether it will work or not, I do not know. But I am quite sure that the experiment is on the way and will be made. We have no force, political, economic or ethical, with which to counter the growing demand that the average man shall find in his work the satisfaction that the exceptional man now finds in his.

It seems to me that we who enjoy our work, and would be horrified at the suggestion that we should spend our working lives doing something completely dull and pointless, have little right to complain if other men now demand that they should enjoy their working lives too. I believe that in this demand we are facing the greatest development and the greatest crisis in Industry since the Industrial Revolution. We may approve of the demand or we may think it fantastic. We may think it impossible or we may merely think it very difficult. We may think that in practice it will cost people more than they are willing to pay for it—that the better answer is shorter hours—more leisure—a further divorce between work and the rest of life. We may think any of these things and we may be right. But one thing is quite clear. The demand for an enjoyable working life will be made—is being made now, though in a muddled and incoherent way. As people of goodwill who are interested in the future of industry, it is our business to consider

how, if at all, it can be met. There has long been argument about the proper definition of a 'working man'. Professional people are always pointing out that the phrase has no meaning, because they too, work, though they are not considered to be working men. I submit that the phrase *has* a meaning. A working man is one who spends his working life doing what he does not want to do. A non-working man is one whose productive efforts give him satisfaction. What they produce, or what they are paid for producing it, is beside the point. To paraphrase Shaw, I hate the working man and look forward to his complete annihilation. May it come soon. •

SATISFACTIONS IN WORK

C. A. MACE

"NO MAN EVER ACTS from a single motive." So wrote Dostoevsky, and this simple truth should never be far from the minds of those who interest themselves in the problem of incentives; for the failure to appreciate the complexity of human motivation is, perhaps, the outstanding weakness of every system of industrial incentives so far practised or proposed.

A new and refreshing approach to this perennial problem has been opened up by Mr Nigel Balchin (1947) in an address to the National Institute of Industrial Psychology. "There are," as he says, "three basic forms of motivation, three sources of satisfaction to be gained from work: a man may work because he must, or because he should, or because he wants to." In the past industry has leaned much too heavily upon the instruments of compulsion, and with the failure of this policy we are led to explore the two alternatives—some form of a sense of obligation, or some form of positive attraction. Mr Balchin presents a persuasive case for making work enticing, and in so doing he has laid foundations for a philosophy of incentives more stable than the traditional philosophy of the stick and the carrot.

Were I further to develop the theme, I could but dot Mr Balchin's i's and cross Mr Balchin's t's. If, in what follows, I try to do something more or something different, it will be to amplify the text which I have quoted from Dostoevsky, to examine some of the social factors in human motivation and incidentally explore in greater detail the alternative which Mr Balchin has rather quickly dismissed—the appeal to some sense of obligation, which is neither an enticement nor a compulsion.

Traditional doctrine has been oversimple. The mistake of the worldly wise, who like to say that "the only effective incentive is the pay packet", is not so much that they overlook other sources of motivation as that they fail to observe the complexity of this motive itself. We all love money, but we love it most for what it enables us to do. To some it may mean chiefly beer and circuses, to others it means greater security, or a better chance for one's children, or greater opportunity for promoting a project for reforming the world. The paycheck theory is not a bad one to start

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from, but it is apt to stifle thought precisely at the point where thought should begin. We begin to understand men's motives only when we know how they spend their money and how they spend their time.

So, too, authoritarian theories are over simple. Those who believe in 'discipline' often fail to appreciate the social conditions upon which respect for authority depends. The abuse of authority and the acceptance of abuse of authority are perhaps in some significant degree industrial manifestations of those strange sado-masochistic tendencies to which Mr Balchin in passing refers—part and parcel of a social and industrial order based on the principle that life, even at its best, is a vale of tears. But we need not go to industrial history for evidence for the fact that human beings derive at least a retrospective satisfaction from being in unpleasant situations and performing unpleasant tasks. Have we not all met men who, when they were boys, were beaten by their parents, who have worked in frightful conditions under bullying foremen, and who feel that in some curious way these things have done them good? Is it not, in fact, a universal truth that so many of the things that we hate doing we enjoy having done? So arises the temptation to suppose that things that are good for us to look back upon cannot be too bad for others to look forward to. The perpetuation of sadistic discipline may have more than a little to do with the masochistic pleasures of recollection. But 'sado-masochism' is a term which covers a wide variety of human eccentricities, from quaint and amiable weaknesses to disturbance of behaviour of a very ugly kind.

It is, however, well to remember that sadistic and masochistic tendencies are pathological variants of forces which have their proper function in the economy of normal motivation. There are, in human nature, forces that impel a man to perform tasks that he finds unpleasant and which he is under no compulsion to perform. He performs these tasks from what he is apt to describe as a sense of obligation, a sense of responsibility to someone, or a sense of responsibility for getting something done. Forces such as these must surely be assigned some function in a balanced system of incentives? "Can we, therefore," Mr Balchin asks, "go over, as the idealists suggest, to 'should' as an incentive and satisfaction . . . to a community in which people work because they believe it is their duty to society to do so, and find satisfaction in doing their duty?" Mr Balchin sees little hope that way. "I do not believe most men will work hard for anything as abstract as society. They will work hard for themselves and their families and their friends or for anything that can be seen and personified and loved. But not for an abstraction like society."

The protracted argument between 'idealists' and 'cynics' would seem to presuppose both that men act only from one motive at a time (*either* the love of self *or* the love of society) and that noble acts spring only from rare and exceptional motives. This is all very unrealistic. Clearly, each one of us, in the state of nature, loves himself more than he loves society, but almost every man for most of his time (in the state of nature) loves some other person or some group more than he loves himself. To sacrifice oneself for a group seems, in cold blood, a strange thing to do. But, curiously, it is

done not only by strange and exceptional people but also by quite ordinary people under certain conditions—no doubt as much to their own wonder and surprise as to the wonder and surprise of those who look on. "I'm a fool," they say, "to put myself out so much for other people, but I can't help it." The fact that we and they are surprised at this behaviour is a reflection upon the traditional popular psychology in terms of which we and they have been taught to think about these things.

This is not simply a matter of things that happen in the heat of battle. We see men work themselves to death for their families and we see them dress themselves in the most uncomfortable of garments out of respect for their neighbours whom they may not even like. No one who has not been blinded by theory would have any doubt about the fact that only very rarely indeed does any man do exactly what he wants. Most of our time we, all of us, are hag-ridden by our personal ties and our sense of social obligation. Between 'the individual operative' and 'society' or 'mankind' there is a series of concentric social circles, the family, the occupational group, national, political or religious group to which 'the individual operative' *feels* himself to belong and on behalf of which he is prepared in varying degrees 'to put himself out'. But we do not know *a priori* what these groups are, or how much the operative is prepared to modify his behaviour on their account, and it has been nobody's job to find out.

To elucidate the facts is among the priorities of incentives research. It is for this reason that the Hawthorne studies of 'informal organization' are important (Roethlisberger and Dickson 1939). But for a more recent example of the bearing of social ties on incentive systems I am indebted to Miss Pearl King, who has been engaged in a study of the attempt to organize a profit-sharing system in a building firm. In this study it was found that the practicability of various possible systems, both of assessing and of distributing profits, turned upon the manner and the degree to which the operatives felt allegiance to the firm as such, to the sub-group engaged upon a particular contract or on a particular site and to the fellow workers in the same trade. A profit-sharing system which on one form of social organization would seem fair and reasonable would on another system of relations seem grossly unfair. Nor could any system be expected to work smoothly without stability in these relations and ties. Some measure of stability in human relations is among the first conditions for the effective organization of a collective will to work. Adequate motivation in an industrial civilization depends upon long-term policy directed to the creation of these stable relations and to the progressive organization of incentive systems which will stand not only the shock of social and industrial disturbances, but also the very different stresses and strain of periods of comparative stability. Unfortunately, however, both the theory and the practice of incentives are peculiarly susceptible to the influence of what we may call 'a crisis psychology'.

A crisis is a critical and dangerous situation, fraught with frustration and precipitating anxiety and aggression, a situation with which routine and traditional responses are incompetent to deal. The natural response to a crisis is improvisation, innovation and a ruthless disregard of vested

interests and of costs. Both the wisdom and inhibitions of experience are placed at a discount, and any proposal, however wild, will receive an attentive ear. Under such conditions drastic expedients, good and bad alike, have their greatest opportunities for trial.

Among recent developments in psychology which bear upon the phenomena of crisis, the most significant lie in the general theory of emotion. The most important contribution to this theory since the work of Darwin is that of Cannon (1915) and others who have contributed to the development of theory of an emotion as 'an emergency response'. A crisis in the life of a nation has most of the features of an emergency situation in the life of the individual; and a close similarity is to be observed between the corresponding social and individual modes of response. In both the situation demands an increase in the rate at which energy is released. Much of the energy so released, when the channels of habitual response are blocked, will spend itself in highly variable trial and error experiments. There will generally be a surplus accompanied by experienced tensions, anxiety and aggression, and overtly expressed in regressive and primitive reactions. How much of the energy is released in profitable experiment and how much in anxiety and aggression will depend upon the degree to which intelligence remains in control. Broadly speaking, unrestrained emotion is always atavistic in expression. Acting on emotion alone an individual or a group will almost certainly do the wrong thing. The primary function of the emotional mechanism is to ensure that *something gets done*. It is the function of something other than emotion to ensure that *what is done* is appropriate to the situation.

In normal behaviour including normal work the energy required for routine responses is well within the limits of the resources of the organism. An emotional reaction, on the other hand, produces its effect only by a draft upon reserves. Hence emotional activity is apt to be followed by reaction or by a phase of retrenchment and recuperation. Reliance upon emotional motivation for persistent or long-term action can have only one end, ultimate collapse. To *maintain* the will to work at an optimum level depends upon *long-term* sources of human motivation.

If, then, apart from very special occasions, we cannot appeal to the emotions, what are the motives that remain and on which we can rely to get the world's work done? We must take as a datum the fact that some work is interesting and some work is dull. There are, no doubt, some jobs that are hardly ever dull. Mr Balchin knows a man who says that he has never done anything that he has not enjoyed and found extremely satisfactory; but the puzzle is that many who work at conveyor belts do not feel like that. To many such workers' work is undoubtedly dull, and the problem is to find reliable sources of motivation for the many dull jobs that have just got to be done.

It is the job that 'just has to be done' that needs to be examined, but we need to study not only the job but also the sort of man who does it and derives a kind of satisfaction, not so much perhaps from doing it but from having got it done. Mr Balchin's friend was perhaps a man of this type, or perhaps not a man of peculiar type but a quite ordinary man working under

favourable conditions. For the significant fact is that sometimes almost any man will do an unpleasant job and do it with a certain gusto; and in the rough we know the sort of conditions under which a man will act like this: if the work contains a certain minimum of inherent interest, if it brings a reward accepted as appropriate and fair, and if it contributes to his self-respect and to a measure of recognition from his fellow men.

In this statement there is, of course, nothing new. Nor is there any reason why there should be. God knows, man has worked in the world long enough to know when he likes working. The point to be stressed is not the motives individually but the importance of their combination. As Mr Balchin does, I put first among the positive conditions of satisfaction in work that the job should have a certain minimum of intrinsic interest, by which is meant simply that the job is done because one likes doing it, i.e. one does it without regard to praise or reward and without fear of punishment or blame if it is left undone. There may be a difference of opinion between Mr Balchin and myself concerning what this minimum is. This would not be surprising, because Mr Balchin does not know what this minimum is. Nor do I. Nor does anybody else. It is a matter for investigation and for practical experiment. My present guess would be that the requirements are less exacting than might have been supposed. Men will endure quite a deal of boredom and strain provided the job, as they are apt to put it, 'has its compensations'.

To provide these compensations may well require a reversal or at least restriction of the policy of specialization and sub-division of labour. Among the factors that set a limit to profitable sub-division, the psychological are the first to be encountered. In many industries these limits have been reached and passed.* In some cases the minimum requirements will be met by very simple changes in the design of a task. In other cases vocational changes may be called for on a national scale. The problem is an old one and the more drastic proposals are well known. Kropotkin (1901) suggested that every man should have two contrasting jobs, spending part of his working time in the factory and part in the fields. The general principle—that of compensatory functions—has in some measure found an indirect application through the reduction of working hours and the organization of leisure. One of the defects of this solution is that it emphasizes the contrast between work and recreation, and this may set up a vicious circle.

Something nearer to Kropotkin's plan was in fact realized in an incidental way in this country during World War II when so many people divided their working life between their ordinary occupation and what was in effect the secondary occupation of 'digging for victory' or some form of civil defence. Those who are responsible for large-scale planning might perhaps consider how far the principle of compensatory occupations could be turned to account as a more permanent feature of our social and industrial

*There is evidence to be found in the publications of the Industrial Health Research Board (Vernon and Wyatt 1914; Wyatt and Fraser 1928), and in the records of the National Institute of Industrial Psychology, of increased production resultant upon increasing the variety of the operations comprised within a single 'job'.

organization. It would seem that any satisfactory solution should take account of the fact that a man can stand the contrast between interest and dullness if the contrast resides *within* his work rather than *between* his major occupation and some alternative activity. It must in the last resort be the work itself which has the compensations. But a modicum of intrinsic interest is not the only compensation. Nor are the compensations entirely of the order of canteens, brightly coloured walls and 'music while you work'. An aspirin is no substitute for therapy.

It is strange how life divides itself into sharp dichotomies on one side of which we find an overdose of medicine, and on the other of which an overdose of jam. One of these dichotomies is that between work and recreation. Another, not less relevant to our problem, is the distinction between a trade and a profession. Psychologically regarded, this is not merely a distinction based on social class. It is also a distinction in respect of motivations. Roughly, very roughly indeed, it corresponds to the difference between those who work because they fear the stick and they want the carrot and those who work for strange and unfathomed reasons with which the stick and the carrot have very little to do.

The most effective types of motivation are fairly common in what are called the professions, and in the skilled crafts. They are found in many forms of public service, in almost any job in fact to which a certain social value is *effectively* attached. It is in this direction that we need to look for new light upon the problem of incentives.

Almost anyone could select from his everyday experience a general medical practitioner, a cowman, a telephone engineer, a minor civil servant, a motor mechanic, a teacher in a school, a factory manager and a night-watchman, each of whom is known to perform his job with adequate motivation. Mrs Jones will have her baby, the cow will have her calf, a fault will develop in the line, the Minister call for a report, a car break down in an inaccessible locality, the headmaster will get a new idea about the syllabus for the school certificate, and the factory catch on fire. All these things may happen at a confoundedly awkward moment. But the doctor, the cowman, the telephone engineer, the minor civil servant, the school teacher, the factory manager and the night-watchman will take their appointed places and do their appointed jobs. Not only do they do their jobs in such emergencies. They take their appointed places and do their appointed jobs on nearly every day of every week and in nearly every week of every year. Why do they do this? Why do they behave in this odd way in the face of all this talk about the need for incentives?

Do they do it for fun, do they do it to save their skins, do they do it for the sake of the pay, do they do it for the good of 'society'? Is the incentive intrinsic interest? Is it the stick? the carrot? or the sermon? If you ask these workers themselves, they will not refer in their reply to money, security, duty or public service. These may be the terms in which we write our letters to *The Times*; they are not the terms in which an ordinary worker ever thinks about his job.

The chances are that what they would say is: "Well, someone had to go

to Mrs Jones, someone had to look after the cow, someone had to dig out the Minister's statistics. If I didn't do the job, it wouldn't be done." Behind this cryptic answer there is a type of motivation which, familiar as it is, no one as yet fully understands. These men stick to their jobs because *in part* they know that they must. They know that they work or they want. They stick in their jobs because *in part* they like them. But this is not all. They stick to their jobs in part because of a natural sense of responsibility, a natural sense of obligation.

This kind of motivation has nothing essentially to do with political, social, moral or religious ideals. It does not depend upon the love for 'anything as abstract as society'. Those who possess this sense of responsibility are neither masochists nor sadists. As often as not they combine practical efficiency with quite a deal of grouching and with the expression of cynical observations about those who employ them, about their jobs and about society at large. If you were to commend them for the conscientious performance of their duties, you would put their teeth on edge.

In the cases cited, there is, of course, a certain individuality in the job, and an individual character in the sense of responsibility. The doctor knows and the cowman knows that the job he has to do is in the main a job he will do alone, and it is a job for which he is personally responsible. But this sense of individual responsibility is socially conditioned. It depends upon *something being expected* and upon the sustaining influence of *someone else's valuation*.

As a first step towards a more systematic analysis of these expectations and valuations, consider the following simple schematic situation. An employer engages sixty men to work a small industrial concern. Endowed, let us suppose, with exceptional capacity for organization and planning, he designs for each of these sixty men a clearly defined job for the performance of which he holds each man individually and personally responsible. Each man receives a reward he considers fair, together with his employer's expression of appreciation and of personal regard.

A simple organization of this kind might be highly efficient and display its own distinctive form of high morale. Each of these sixty men might be reasonably hard working and contented with his job, but such a pattern of organization would have its obvious limitations. There would be no reason, inherent in the situation, why any member of the working group should pay any attention to what his fellow workers did. He would feel no responsibility for them, and from them expect neither commendation nor blame. Each man's loyalties, his sense of responsibility, his expectations of consideration and regard, would all be focused and canalized in a single direction. Except in relation to the single individual, each man is in a state of psychological insulation.

But the same employer might have organized the same sixty men in a hundred other ways. He could have set them to work in pairs, in groups of three or five or ten, and have assigned to each group a collective responsibility for the job it had to do. He could have called upon the group of sixty men to arrange the jobs themselves, he could have delegated and distributed

in a variety of ways, his own responsibility for planning and for the success of the concern as a whole.

Within this simple abstract scheme—the scheme of 60 men engaged in production—we can find a place for every pattern of industrial organization. In such patterns there are two independent variables, each of which will be reflected in motivation and morale. There is, firstly, variation in the manner in which power and responsibility is distributed in the working group. And there is, secondly, variation in the degree of formality of the social arrangement through which power and responsibility is allotted.

The way in which responsibility is distributed is a matter which would readily lend itself to diagrammatic and quasi-mathematical treatment in the manner of Moreno (1933) or Lewin (1936). By dots and lines we could symbolize the position and the relevant relations of every individual in the group. The limiting case of the sixty men each directly and individually responsible to a single directing agent conforms to the type of organization which Moreno calls a star. The creation of other supervisory posts transforms the pattern into that of the familiar hierarchical form. When the work is done by men co-operating in pairs or larger groups, the pattern is composed of horizontal as well as of vertical links. But, now, in what precisely and concretely do these links consist?

Of the technical concepts of contemporary psychology, that which is most readily applicable is the concept of an 'attitude', defined as a more or less permanent state of readiness to behave in certain ways. But this general concept is not sufficiently specific for the analysis of the relations with which we are here concerned. The specific attitudes which operate most powerfully in a co-operating group consist of a tissue of *expectations* and of dispositions to respond to expectations. Every member of a working group is subject to the pressure of surrounding expectations, and he is effectively a member of the group only in so far as he is responsive to these expectations. A man who is unresponsive or resistant to the expectations would be a foreign body encapsuled in the group. My suggestion is that it is in his susceptibility to the pressure of surrounding expectations that a man's sense of responsibility effectively consists.

Hence to understand the nature and the conditions of a sense of responsibility, we have to look not so much for a force within the individual but for a force that resides within the group, and usually in a very local group. A man has a sense of responsibility just in so far as his group holds him to be responsible, and he has a sense of responsibility in respect of those acts for which he is held responsible, and for very little else.

For example, consider the case of a particular miner living in a particular mining village and working in a particular pit. At the present moment he is subject to the following, among other, forms of social pressure: (i) the pressure of what England expects of him in the current crisis of production, these expectations being voiced, for example, in the leading articles of the daily press; (ii) the pressure of the expectations of high officials of the National Coal Board, of the Government and of his Union; (iii) the more local pressure of the expectations of the supervisory staff at his pit; and

(iv) the still more local expectations of his wife and family and of his immediate associates in his daily working life. Clearly, local pressures are much more potent than pressure propelled from a distance. One might almost say that the power of an expectation at any place varies inversely with the square of the social distance of that place from the point of emission. Local pressures, moreover, may act as a kind of insulating barrier against pressures more remote in origin. This is part of the explanation of the relative ineffectiveness of long-range propaganda. Hence the miner's response can be predicted only by those who are suitably placed to see what the more local forces are.

Consider a second example from much nearer home. It is at about half past four on a bright summer's afternoon. You are seated in the lounge of some hotel with half a dozen friendly strangers to whom you have just been introduced, and to whose expectations you are predisposed reasonably to conform. For some months now you have also been subject to the pressure of public expectations in the matter of saving fuel and power; and now at half past four on a summer's afternoon you observe that in a nearby alcove in the lounge a light is burning and power is being wasted. Would you, under these conditions, spend the four necessary seconds to take the four necessary steps to switch off the unnecessary light?

It is difficult to predict with certainty any particular individual's behaviour, but we can be reasonably sure that many public-spirited citizens would reply to this question in some such way as this: "Well, I hope I'm not a moral coward, but I confess that under these conditions I should feel a bit uncomfortable. I am quite prepared to regard an act of that kind as my duty so long as people do not think me a solemn ass for so regarding it." Here, too, the nature of the response depends in a very considerable measure upon the pressure of surrounding, *local*, expectations.

In an industrial situation, as in others, it is the immediate, the local, the latent or horizontal pressures which have required the closest observation. To predict the behaviour of a plumber it is not enough to know the expectations of the man who holds the carrot or the stick. Nor is it only a matter of the expectations of the officials of the plumber's union. We must also know the expectations of the plumber's mate.

It is for this reason that there would appear to be a more effective use of social pressures in the type of organization in which responsibility is placed not exclusively on the individual but on the working group. The principle finds perhaps a measure of recognition in the institution of production committees and other machinery for the wider diffusion of responsibility and power. But in the further development of this machinery some attention will, I think, need to be paid to the second of the variables to which reference has been made.

Co-operation in production, as in other ways, may be more or less informal, more or less independent of specialized social machinery such as a written constitution and formulated rules of procedure. Formal and informal types of organization have each their characteristic advantages and their characteristic limitations. But it would be a mistake to look at them as opposed alternatives. It is the case rather that formal types of

organization can be systematically used for the development of the more flexible organizations of the informal type. Just as a law, at first enforced by penalties, so far as it is observed, tends to become a convention or custom, so a 'constitution' becomes a tissue of attitudes and habits of co-operation. It becomes, in short, a system of expectations of behaviour, and expectations that are realized in fact.

Of such are composed the codes of practice and conduct which regulate the behaviour of the medical practitioner, the cowman and the post office engineer. When we place in opposition to one another the profession and the trade, we are apt to think of the first as controlled by an implicit code of conduct and the latter as subject to explicit working rules. But the skilled craftsman works to principles and standards not less exacting than the demands of professional etiquette. In both, the operative forces are not so much regulations as tacit understandings.

We are here concerned, in fact, with something rather fundamental. The outstanding difference between the reactions of a machine and the response of an organism lies in the greater flexibility of the latter. And so it is that a constitution or a code, translated into a system of human expectations and of inclinations to respond to expectations, acquires that element of adaptability which alone will make a constitution work.

There are, accordingly, reasons for supposing that joint consultation, production committees, and other forms of co-operative machinery will prove their effectiveness just in so far as they are treated as transitional instruments in the formation of co-operative attitudes and habits. Those who expect this machinery to produce automatic effects will run into patches of gloomy disillusionment. Just as the use of physical machinery entails training the operative who uses it and the employment of technicians by whom the machine is serviced, so the use of social machinery entails social education and the services of the social technician. In design and re-design and in day-to-day adjustments of this social machinery we are throughout concerned with psychological problems, for the stuff of which the machine is made is a tissue of human expectations.

A scientific study of these problems would afford a new approach to the problem of incentives. In the past the control of human energies has been thought of either as control *from above* or as control *from within*. To foster codes and standards in a cohesive working group is to invoke the principle of control *from around*. The importance of these social forces lies not only in the fact that they provide a new incentive but also in the transformation they effect in the incentives traditionally employed. Even the ultimate sanction of 'the sack' acquires a new significance when it ceases to depend on the arbitrary decision of an individual and becomes, instead, an act which is backed by the responsible judgement of a co-operating group that the man to whom it is applied is one with whom it has been found impossible to work. Similarly, bonus incentive systems take on a new meaning when they represent not the decision of management, sitting in secret conclave with psychologists and other consultants to design the perfect carrot for the reluctant mule, but the collective judgement of a responsible working group

meeting in open forum to assess the reasonable reward for reasonable exertion.

The forces that reside within a working group may well provide the chief of the untapped sources of industrial motivation. We cannot assume, however, that these forces have any peculiar magic of their own or that they are omnipotent. For no man ever *works* from a single motive. He does not work just because he must, *or* just because he should, *or* just because he wants to. When he works best he works because he wants to, *and* because he knows that in the last resort he must, *and* because all the time he feels the pressure of surrounding expectations.

COMMENT

By Mr Nigel Balchin:

I entirely agree with Dr Mace's contention that "no man ever acts from a single motive". In my paper, which Dr Mace quotes, I had no intention of suggesting that the three main sources of satisfaction from work were mutually exclusive.

Regarding Dr Mace's belief in the appeal to a sense of obligation—and particularly to a sense of the expectation of others—I have no doubt of the power and importance of these things. If I doubt man's willingness to work for the sake of society it is purely because 'society' here is impersonal and undefined. Define and personify 'society' so that it becomes a local group and the case is altered.

I have, however, one word of warning to add. The tone and expectations of the group may provide a positive incentive, but they *may* provide a negative one. A man may work because it is expected of him, but he may also slack if *that* is expected. The influence of group tone and expectation is only a valuable incentive where the general attitude is already in favour of a high degree of effort, and where the problem is mainly one of maintaining a level rather than raising it. What a man does because it is expected of him is *what he has done before*. That is why it is expected. Our problem in this country is to raise the level of effort at a time when the expectation of the local group in many instances is in favour of lowering it. And I believe that this can better be done by influencing the group through the individual, than by influencing the individual through the group.

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THE PSYCHOLOGICAL ADVISER'S PROBLEMS

JOHN B. PARRY

THE PSYCHOLOGICAL ADVISER has many problems, more than I can name in a short paper. All I can do is to draw a limited sample. I have selected eight topics and make no claim for any logical plan behind this choice; on the contrary, some issues very obviously overlap others. I will start by indicating eight themes and then devote a few minutes to each. These, then, are the topics:

1. Application.
2. Responsibility.
3. Intelligibility.
4. Divided allegiance.
5. Anticipation.
6. Undue pliancy.
7. Methodology and subject matter.
8. The Psychologist.

Most of these issues exist for all kinds of advisers but the presence of the last, which occasionally leads to widespread tensions in our type of work, is apt to give the others a particular emphasis.

A paper of this kind is bound to stress difficulties rather than agreements and I should be sorry to give the impression that I think employers of psychologists unreasonable as a class. This is very far from my view and what I am going to say is mainly concerned with difficulties that arise exceptionally.

THE PROBLEM OF APPLICATION

The psychologist entering on his first job will not be so simple as to imagine the world one great laboratory in which he can carry out experiments without consideration for cost or circumstances; nor, we hope, will he be cynical enough to cast aside scientific principles and trade on his reputation as a specialist. If he has any grasp of reality he will see that he has to tread a path between purism and opportunism, and it needs little sophistication to know that such paths cannot be mapped in detail. But he may well ask for some guidance as to when he is in danger of being too rigid and when too flexible.

This paper, based on an informal talk given to the Industrial Section of the British Psychological Society on 5 December, 1950, originally appeared in *Occupational Psychology* 1951, 25, 124-130. Dr Parry had been a Government psychologist since 1942.

To begin with, he should guard himself against strong preconceptions about the attitude of his employer or those to whom he must answer. While the head of a business or the director in a Service ministry is unlikely to have the mind and training of a don, that is no excuse for leaping to the conclusion that all laymen are scientific Philistines; such an opinion should only be held when events make it impossible to entertain any other. Very often the layman will realize that he is liable to subjectivity in his judgements about people and that he tends to draw conclusions about human affairs on too slender samples; where such admissions are readily made, the adviser should have a good chance of making a contribution of which he need not feel ashamed.

Again, there will be occasions when he will be able to improve a desperate practical situation without recourse to full-scale experiment; he must learn to recognize such occasions as they arise, even if by doing so he entails a risk of being rounded on years later and charged with the introduction of unproven magic. I do not mean, of course, that he should not seek for conditions approximating to the laboratory ideal: he should always start with this in mind, but he must be prepared to temper his requests in the face of grave and urgent difficulties. If, for example, he feels reasonably sure that he can effect a major drop in some form of wastage by bringing in selection tests which have not been tried out on this particular population, he will, in my view, be justified in conducting a posthumous validation. This procedure is entirely different from recommending the use of untried tests with nothing but strong face validity to support them.

This application problem confronts semi-technical staff as well as the fully-fledged psychologist. In training personnel to administer tests or conduct interviews emphasis should always be given to the development of judgement in matters of this kind. A parrot-like adherence to the precepts governing standard testing may make for almost as much mischief as their total disregard. To know the moment at which to put one's foot down requires common sense and insight as well as training.

Scientists at the higher levels will find the same difficulty in balancing the claims of scientific detachment and political consideration. The need for detachment, while desirable in most types of business, is not usually at the heart of successful enterprise; but the scientist who turns his back on objectivity must always be in danger. This does not mean he must be blind to the trend of circumstances; only a fool would be that. But he should be careful not to become enmeshed in the toils of intrigue.

THE PROBLEM OF RESPONSIBILITY

Where do the adviser's responsibilities end? A frequent answer is that responsibility ends on the threshold of executive power, in other words, that the man who asks for advice must be the one who acts on the advice given. This distinction sounds clear and neat enough, and it may, indeed, go unchallenged during years of fruitful collaboration; but if a strain is put upon collaboration varying interpretations of these key phrases come to be made. When does advice become more than advice? When does action cease

to be executive? At this point recourse is often had to a further concept. Advice, it is said, becomes more than advice when it overlaps the confines of policy; or, it is not an adviser's job to dictate policy but to offer solutions for the problems which policy dictates. Here we have another distinction that cannot be pressed too far. Certainly no psychological adviser would claim a right to influence policy unrelated to the handling of personnel, but what of personnel policy? Can a psychologist serve his employers usefully if his advice is not asked till policy governing selection and training has already been decided? Can he really claim to be more than a technical hack if he accepts such terms without protest? And what line must he take if, as a result of policies whose incompatibility is obvious to him (if to no one else), he is asked to achieve the impossible, if, say, he is confronted with the injunction, "We want this trade's training wastage reduced by half but we can't tolerate any reduction in our training standards"? (Such an instruction, reasonable enough where no systematic selection exists, can become absurd where selectors have already done their best to alleviate the situation.) Is it not a fact (and a perfectly natural one) that an adviser, trained in a technique of whose existence others are only dimly aware, should be the first to detect such inconsistencies, and if this is true is it not a mockery to employ such specialists on the terms that have just been indicated? And finally, is it not a wanton confusion to suggest that an adviser who claims the right to be heard before a policy is formulated is assuming the right to formulate policy himself?

The question of advice and executive power also arises at a much lower level, and here, in my view, the adviser is well clear of responsibility. I refer to the execution of his recommendations as they affect individual cases. Here it may well prove an embarrassment if the authors of selection programmes are forced to deal with the many questions to which the acceptance or rejection of persons give rise. In a well-balanced organization the executive body will, in fact, endorse their advisers' recommendations in the vast majority of cases. It is, of course, true that an adviser's position may become difficult, if not impossible, should his advice be disregarded too often, a situation that theoretically could arise if someone with more prejudice than judgement stepped into a position of power.

THE PROBLEM OF INTELLIGIBILITY

How should the adviser present his advice and the studies on which it is based? There are two tendencies here and neither is completely satisfactory. He can write his reports as though he is addressing his professional colleagues or he can eliminate every trace of technical vocabulary. The first may lay him open to the charge of 'blinding with science', the second may be impossible without a serious distortion of meaning. How is this dilemma to be resolved? Should two texts be produced in the manner of Hindu philosophy, one to satisfy an esoteric priesthood, the other for the unenlightened? Or should a compromise be sought, faintly intelligible to the non-psychologist and not utterly beneath the professional's notice? There are difficulties either way. If the specialist over-simplifies he may not only incur professional

suspicion, but persuade his flattered masters that they could do the job themselves. If his presentation is difficult he may be charged with occultism, impractical idealism or plain muddle-headedness. In my view it is best to aim at an almost brutal simplicity in a short and pithy text, loading up the evidence in an appendix which a busy executive need feel no obligation to digest.

These remarks, however, require some qualification. One of the adviser's less obvious tasks must be a long-term educational effort; that is, he must aim continually at the gradual absorption by his employers of at least some of the more basic concepts. It is my experience that some of these concepts are grasped with immeasurably more ease than others. The central tendency, for example, is familiar to everyone in terms of batting averages, weight for height, etc. Indeed the notion of an average dominates the layman's mind to such a degree that the correlative concept of spread can hardly take root at all. How can this one-sidedness be redressed? Not, I think, by talks, however friendly, on the standard deviation. But perhaps through discussions of form (the sober consistency of Hassett contrasted with the erratic brilliance of Hutton)* or even more personal applications ("You may weigh three stone more than the average man of your age and height, but that doesn't necessarily mean you're dying").

Another difficult concept is sampling. Sampling theory is sensed at least at the level of caricature ("Naturally I can't expect you to answer that question till you've measured five thousand bods."), but the idea of a 'fixed standard' dies amazingly hard. For whatever reason, most laymen assume that the ability to perform a task is of an all or nothing kind and that the function of a selection authority is to segregate the possessors from the non-possessors. No amount of talk about the distinction between attainments and aptitudes will eradicate this assumption, nor will any demonstration that, if the facts were as they are supposed to be, no flexibility in selection would be possible. Once again it is not suggested that this blockage can be removed by propaganda on behalf of the continuous variable, but an appeal to observation (A runs faster than B, but that doesn't prove B can't run at all) will perhaps in the end achieve something.

THE PROBLEM OF DIVIDED ALLEGIANCE

Entry into the majority of jobs puts no special strain upon loyalties. There may at times be conflict between the demands of job and family, but such conflict is occasional and, more important, the tension is not implicit in the job. The adviser, however, is in the difficult position of having to serve two masters and to succeed in this without damage to his integrity will call upon all his perspicacity. He must, according to his temperament, guard against a too wholesale identification with either party. If he blazons his profession blatantly he is bound to lose the confidence of his employers; on the other hand, if he becomes unduly caught up in the business or Service he is advising he will soon cease to be a scientist. The problem naturally becomes keener

*For Hassett read Lawry: for Hutton read Boycott. *J.B.P.* 1971.

the more the adviser is isolated from his kind. For this reason it is desirable for psychologists to hunt in couples or at least to maintain regular contact with some parent group. Again, this division of allegiance is far more acutely felt when the adviser's subject matter is a theme of controversy; it is, for example, more difficult for a psychologist to keep his balance than a chemist or a meteorologist. The psychological adviser, therefore, must avoid the pitfall of seeking undue security from his immediate environment. To work for the good of his employers he must maintain a detachment, adopt to some extent the standpoint of a critic. His watchword must be candour without arrogance. If he is too anxious to please, he becomes a prey to those emotional attitudes it should be part of his job to appraise. At the same time he must feel sympathy to others in their attitude to time-honoured customs and procedures. If, for example, his task is to overhaul interviewing methods he will not start by denouncing the old ways to those who have been practising them for years; similarly, to inveigh fiercely against the shortcomings of essay-type examinations is not always the best way to win converts to new-type tests. The grip of custom should be thawed rather than broken.

THE PROBLEM OF ANTICIPATION

The dental surgeon, in addition to filling cavities, will from time to time take action to prevent the flowering of future chasms. Similarly, the astute adviser will note impending strains in the personnel structure while carrying out his daily duties in repairing existing breaches. But, for the adviser, to see cannot always be to act, since action needs the consent of an executive, and executives are often too busy with day-to-day problems to undertake prevention work. Hence it is usually not much good to say, "If you'll let me do this now you won't have this happening in twelve months' time." Nor, in twelve months' time, is it any more successful to point out, "If you remember I drew your attention to this but you decided to do nothing about it." The best way to handle this type of situation is by indirect suggestion. Suppose, for example, that while investigating the reasons for poor morale among cooks you detect the germs of a similar situation among telegraphists, there is no harm in asking if telegraphists are giving satisfaction. If the answer is yes, there is still no harm in expressing the hope that they will continue to do so. But it is better to stop at this point, having with luck sown a seed of doubt which will lead your employer, months later, to think he has himself detected the trouble that has now become rampant. If he then thinks he foresaw the danger before anyone else (including you) he will be far more likely to turn to you for assistance than if he remembers that you raised the issue and he sent you about your business.

THE PROBLEM OF UNDUE PLIANCY

The employer who is genuinely concerned about personnel problems has no incentive to seek any but the best psychological advice. I do not for a moment doubt that in the majority of cases requests for aid are genuine, but every now and then less creditable motives show through. There are still

executives who think privately that psychology is a lot of tomfoolery but who lack the courage to say so. They may even feel that, deplorable though the current fashion for advice may be, they will somehow lose face if they make no attempt to follow it. One way of solving this difficulty is to seek a tractable psychologist and wear him as a kind of progress badge. Sometimes the adviser proves less pliant than had been foreseen and a stormy union ensues; at other times he enters all too readily into the task of supplying circuitous rationalizations for his employer's theories. This menace undoubtedly exists although it might be greater if psychologists as a class were more malleable. But this type of situation will need watching as the profession becomes more firmly established so that the prospects of securing a livelihood by it make added appeal to the morally invertebrate.

THE PROBLEM OF METHODOLOGY AND SUBJECT MATTER

Many advisers are employed less for their knowledge of a particular subject matter than their general understanding of the scientific approach. The psychologist is not a member of this second category, but he sometimes suffers from those who are. The chief reason for friction of this kind is the failure of the ordinary methodologist to understand his methods' limitations. These remain concealed because the applications of the non-biological sciences are nearly all of a general kind. While psychology, like every other science, is founded on general principles, many of the applications of personnel research stem from the psychology of individual differences, a secondary science for which no counterpart exists elsewhere. Psychology became aware of these limitations a good half-century ago, when the advances of the mechanist school were suddenly and finally bogged down. The obtuseness of some even high-calibre scientists in grasping the methods and intentions of psychological enquiry is largely derived from this elementary confusion.

THE PROBLEM OF THE PSYCHOLOGIST

Finally the question of the psychologist himself, or rather of the role society persists in ascribing to him. If we press behind the superficial fears and confusions, the distrust of intelligence tests, the inability to distinguish the normal from the clinical, we eventually find a final reservation. In the minds of the public the psychologist is the man who has sought to destroy magic by showing that the need for it originates in the mind. The need, however, being indestructible, the public performs the subtle operation of transferring magical powers to the supposed destroyer. Hence the psychologist becomes a witch doctor, a dealer in black magic, a sinister object whose menace is most easily neutralized by ridicule; indeed, ambivalence has begotten one of its most sensational hybrids in this figure of priest-clown. However remote these fancies appear from such humdrum activities as test construction and the study of instructional techniques, they none the less in certain circumstances breed a near-neurotic attitude towards psychological activities of the most normal kind. How should the psychologist behave in such a setting? It is sometimes said that because he is a psychologist this is just the sort of

situation he should be capable of handling. This is rather like telling a physicist to make himself at home in an atomic cloud. It should perhaps be easier for a psychologist than another man to avoid involvement in a situation, but there are limits to the possibility of detachment, and, even if there were not, it is pretty certain that the psychologist would be dubbed aloof and cold-blooded for his efforts. By all means avoid trivial entanglements and exasperations, but when the big challenge comes do not kid yourselves that it is only mice in the wainscot.

The three contributors to this symposium on occupational success, first published in 1950, were all members of the vocational guidance staff of NIIP. For this reprinting postscripts have been added by the two surviving writers: Dr Joan Wynn Reeves is now reader in psychology at Bedford College in the University of London, and Mr J. G. W. Davies an executive director of the Bank of England.

WHAT IS OCCUPATIONAL SUCCESS?*

J. G. W. DAVIES

TO TRAVEL HOPEFULLY, we are told, is better than to arrive. If this is so, psychologists have before them a long vista of delightful uncertainty before they arrive at unchallengeable criteria of occupational success and taste the accompanying disillusion. The years 1930-50 have enlarged the apparatus of psychological assessment and widened the areas of activity in which the manipulation of people is thought of as a technique. But in the evaluation of persons at work they revealed the complexity of the problems without furnishing a conspicuous number of solutions. We saw projection techniques and the observation of group behaviour added to an increasingly refined array of aptitude and attainment tests. Much was done to systematize principles of vocational training and work design. Policy and practice in staff management and in the development of human relations at work were influenced by technical concepts as never before.

All the more frequently, then, do we find ourselves constrained to judge the effect upon persons at work of methods and devices which we have employed in their interests. A firm has developed a new system of joint consultation or a revised scheme of incentives. Can its influence be estimated and, if so, by what indices? One of the Armed Forces radically revises its method of training non-commissioned officers. How can their effectiveness be assessed so that a comparison may be made between the end products of the old and the new regime? An organization has adopted a fresh technique for selecting its foremen. On what basis is their competence to be judged? Young people receive vocational guidance. What is the measure of their progress and adjustment so that the value of the advice may be calculated? Men are admitted for a course of treatment and training at an industrial rehabilitation centre. What indicates their subsequent degree of resettlement at work?

The disagreeable facts are that occupational adjustment takes place in real-life situations, and in real-life situations you have to take the criteria you can get. These criteria usually possess serious limitations, but, as soon as

*Reprinted from *Occup. Psychol.*, 1950, 24, 7-17.

the situation is manipulated or controlled for the purpose of eliminating these limitations, it is apt to pass from the real-life to the artificial and there is no guarantee that the findings will apply when normal conditions are resumed. If the criteria are objective, they either cover only a part of the total job (a part whose relationship to the whole cannot be precisely calculated) or they are at the mercy of forces which can neither be controlled nor disentangled from the influence of the technique which has been applied by the investigators. If the criteria are subjective, however, though they may bear on the real nub of the matter under investigation, they are so liable to distortion and the consistency of informants is so difficult to assure that the findings are inevitably suspect. The techniques of asking A about B are in their infancy: and the knowledge of B about himself, even if it can be tapped efficiently, is inevitably the product of a mass of attitudes and feelings which are not all at the conscious level.

In their work on selection procedure in the Forces, Vernon and Parry (1949) set out the principal categories of criteria which have been used together with a sketch of their limitations. Although they are specifically concerned with selection procedure, their classification, with one exception, covers the chief criteria of occupational adjustment found in the appraisal of related techniques. They assign the criteria to four categories: (1) objective records of individual performance, (2) differences between groups of known characteristics, (3) results of examinations or tests of knowledge and skill, and (4) gradings and assessments. To these we must add objective records of *group* performance. Bavelas (1947) and Coch and French (1948), for example, contrasting group decision with imposition by management and with agreement between management and elected workers' representatives as a means of reorganizing work, took group records of productivity as their main criteria of differentiation. In the studies by the Survey Research Center (1948) at the University of Michigan of parallel working groups in a large insurance company, the groups are again differentiated in terms of their group productivity.

It is fashionable to take other criteria falling under this last heading. Vernon and Parry distinguish between direct and indirect records of performance. Figures of output, for example, are direct records: earnings, breakage or accident rates, savings in overhead costs are indirect records. Other indirect group records which have found favour in industrial circles are sickness and absence rates, labour turnover and volume of spoiled work. In the Services a parallel group of criteria were often regarded as measures of good adjustment—rates for absence without leave, psychosomatic sickness, venereal disease, requests for transfer, etc. This series of indirect criteria are sometimes referred to specifically as 'morale indicators'. The assumption is that, where productivity cannot readily be measured or where various uncontrollable factors cause it to fluctuate, a difference in the amount of stress and tension experienced by several groups will be reflected in a different incidence of those symptoms of distress. It is an assumption which also recognizes the force of Ryan's (1947) contention that productivity alone is not the best criterion of well-designed work, but productivity in proportion

to the 'cost of work'; that is, the physiological and psychological effort it demands and the emotional wear and tear associated with it. He includes here such factors as bad relations with supervisors, intra-group friction, insecurity and unacceptable systems of payment.

I doubt whether there is a firm scientific foundation for the use of these criteria, though it is highly likely that they have their value as pointers. The skill and adjustment to work of a group in which these rates are high probably *are* inferior to those of a group in which the rates are low, assuming that evidence is available on which to establish approximately average rates and that the groups are engaged on broadly comparable work. That is not to say, however, that much weight can be attached to statistically significant but relatively small differences in these rates among working groups which have been experimentally subjected to some kind of changed procedure (e.g. revised training, fresh incentive bonus payments, joint consultation machinery). The accounts of the Hawthorne experiments showed the effects even upon daily output of domestic and personal problems and of all that is going on outside the place of work (Roethlisberger and Dickson, 1939). The same experiments suggested the direct influence on output of changes in the composition of working teams. The concepts of field theory clearly summarized by Jaques (1948) in this journal open up to us a picture of an even more complex causation of behaviour than we inherited from traditional experimental psychology.

In real life it is difficult over a period of time to avoid changes in personnel and changes in organization or technology. Even if these do not occur, the effect of economic movements, of trade union policy and practice, of the state of trade in the particular industry concerned and many similar factors can neither be discounted nor controlled.

Workers in industrial, social and educational psychology are familiar with the limitations of Vernon and Parry's third and fourth categories of criteria. The authors themselves lucidly expose their weaknesses. Tests and examinations, even when objectively constructed and marked, are apt to deal with only some of the skills and knowledge involved in the actual job, and these may not have been accorded the appropriate relative weight. If they are tests of training, accepted standards of competence may vary from time to time. Training and everyday work are not always as well aligned as they should be: and in many occupations adjustment depends on qualities of personality and on a series of relationships quite as much as on the testable attributes of skill and knowledge.

When we turn to gradings and assessments, besides the distortions caused by 'halo' effect, individual prejudice and malcomprehension of precisely what is being judged, we usually find the statistically distressing features of poor reliability and consistency, the absence of definable units to form a continuous scale of judgement and the difficulties of weighting a series of gradings so that they may be combined into a valid total estimate. Add to these the limited knowledge which we possess about the personal equation in interview and conference situations and about how its effect compares with that of written instructions in getting gradings and assessments,

and we see how heavily mined is the ground over which we are advancing. I do not intend here to evaluate the technical niceties of guiding subjective judgement. I prefer to draw attention to certain differences of viewpoint which I have noticed in those who attempt to assess occupational adjustment, differences which may well call for some acceptable terminology.

One must not ignore, of course, the great difference between studying the adjustment of persons who are all working together and of persons who are dispersed among a wide variety of different environments. Morris's (1949) account of the follow-up of officers selected through War Office Selection Boards illustrates the pitfalls encountered in trying to compare the adjustment of young officers scattered throughout a multiplicity of units, each of which may have had a quite different experience of war service. In the training units, however, which all possessed the same function, which were not numerous and which each contained appreciable numbers of the candidates, a comparison was more readily made. Yet these officers were all occupying a common role and, since the comparisons were made Arm by Arm, they were in units which were governed by a common culture, a common form of organization and a common background of technical knowledge. How still more difficult, then, is the task of following up vocational guidance or rehabilitation cases where the subjects are divided among every kind of occupation and every kind of industrial, commercial or professional unit! But, even where people are apparently working together, caution is needed. In a substantial works there can be a great diversity of efficiency, morale and managerial practice among the component departments. Comparative productivity studies in the cotton industry, for example, have shown the uneven character of units even within the same mill (Vincent 1948). There may be quite serious obstacles to comparing the adjustment of, say, a group of engineering apprentices trained centrally in a large works and then dispersed among its various shops.

It is, incidentally, interesting to speculate whether, supposing we accept the legitimacy of the 'morale indicators' as criteria for the adjustment of whole working units, it is justifiable to attach weight to their incidence among (1) a group of persons scattered among the subdivisions of a large organization (e.g. the apprentices mentioned above), or (2) a group of persons engaged on the same work, but scattered among a variety of quite separate units (e.g. a follow-up of nurses trained in the same hospital and then dispersed throughout the Health Service), or (3) a group of persons following diverse occupations in a multiplicity of organizations (e.g. ex-patients of a psychiatric clinic). At first sight the value of recording the incidence of, say, job changes, absence and minor sickness among these groups would appear to decline in proportion to the reduction in the homogeneity of the subjects' work and environment. But this decline may not be as great as it seems. True, the greater the number of organizations among which individuals are dispersed, the greater is the variety of stresses and supports which influence them. One occupation may afford a conventional outlet for expressing distress which is denied in another occupation (e.g. joining in an unofficial strike). On the other hand, these symptoms which are being recorded

may, on the whole, be pretty universal, and within groups of sufficient size the especially good and especially bad working environments may tend to balance one another. Besides this, even persons who compose a single working unit are subject to very different forces in their homes and away from work. Society is no respecter of occupations in providing domestic inconvenience, ailing children, unfaithful wives or indigent parents.

The task of determining adjustment is also much affected by the extent to which proficiency depends upon the successful assumption of a role (that is, a recognizable series of relationships with other persons) as well as upon skill or steady industry. A capstan operator in a machine shop, for example, can be perfectly competent without making any very definite relationship with his foreman or his fellow-workers. No doubt harmonious relationships add to his satisfaction and may act as a further incentive. If he is a difficult or disturbing person, his own work and that of others may be indirectly affected. But he can adopt a neutral or negative attitude without much detriment to his function in the organization and without much sense of stress.

For a foreman, a salesman, an administrator, an officer, however, the role *is* the job. Knowledge and skill are important, but success is impossible without the adequate handling of continuous or intermittent relationships with groups or with individuals. Non-participation is incompatible with any performance of the work. And it is the complexity of these relationships that is apt to be ignored in choosing criteria of adjustment.

In the opening paragraphs I gave examples of the kinds of activities which require to be followed up by an appraisal of occupational adjustment. They include vocational guidance and placement, remedial treatment (medical, psychological or social), vocational training, vocational selection and techniques of personnel management in its unspecialized sense. It is at once apparent that in some of these fields occupational adjustment is not only more difficult to assess and compare than in the others, but that it means something rather different. An employer who adopts a training scheme, a form of selection procedure or a system of joint consultation, is usually interested in its contribution to the efficiency of his firm. If he is hardheaded and misanthropic, occupational adjustment is expressed only in terms of productivity, sales, lowered costs, quicker service. If he is broadminded and benevolent, he pays far greater attention to the 'cost of work', but fundamentally the same criteria prevail. He must be considering the efficiency, prosperity and well-being of the organization before that of individuals.

At the other end of the scale the doctor following up rehabilitated patients or the psychologist following up vocational guidance cases is concerned entirely with the material and emotional satisfactions which employment may provide for the individual. If the opinions of employers are taken into account, it is usually to estimate the advantages which the employers' appreciation will bring to the individual rather than the contribution which he may make to the employer's unit.

Mingled in the thinking which governs these two classes are traces of an attitude which reflects what might be called the 'standpoint of the

synoptic bystander'. This is the standpoint of someone who is concerned not only with the adjustment of individuals and the well-being of working organizations, but with the benefit accruing to the community from the optimum use of talent and the attraction of the best men to the most important and useful occupations. These are usually people whose tidy minds are offended by the spectacle of a man working below his full capacities, e.g. a man of high intelligence and good education contentedly and happily working a small farm, or a first-rate statistician setting the odds for a big turf accountant when government departments are short of statisticians.

I should like to distinguish at this point between several forms of adjustment which appear in the systematic studies of the subject. First, there is the relatively straightforward form of occupational proficiency. Here the investigators are trying to measure the skill and knowledge which a certain job is said to require. Occupational proficiency is most commonly taken as a criterion for estimating the effectiveness of training courses or the success of men selected for specialized training. For example, when, in the Army, men sent forward for training as wireless operators were judged on a series of tests at the conclusion of the course, investigators were interested purely in how quickly and accurately they had learned to send and receive messages and how readily they had at their command the range of knowledge about intercommunication procedure, maintenance and elementary theory which the trade needs.

At the second stage, operational proficiency, the investigators were interested in how the men applied their skill and knowledge in a certain setting as members of certain working groups. Here their behaviour and attitude to superiors, equals and, in some cases, inferiors, become important. Their toleration of the stresses of active service, the frame of mind in which they regard regulations, discipline, separation from home, boredom, all become important. Their absorption into a culture, their identification with a group, their resistance to environmental conditions matter as much as their trade proficiency. Here we are dealing with occupational adjustment—their capacity to adapt their skill to the setting of their daily job. It is something which tends to be viewed more from the standpoint of authority or of the synoptic bystander than from that of the individual.

In other studies, however, we find the concepts of occupational happiness and occupational success. For example, the NIIP (1937) follow-up of vocational guidance cases endeavours to combine both these concepts, all the subjects being required to supply their own estimates of how satisfied and how successful they have been with the occupations which they have pursued. This is an example *par excellence* of a study concerned only with the individual's interests, for no data were obtained from other sources. Thorndike (1934) in his earlier work on the prediction of vocational success uses three main criteria—earnings, job status (categorized by Thorndike on the basis of its level of skill, responsibility, chances of advancement and security as reported by the subjects) and the subject's interest and satisfaction. Dr Earle's (1931) vocational guidance follow-up of elementary school children in London also took earnings as an objective criterion and added

to its length of job tenure. Ratings of satisfaction and 'satisfactoriness' were obtained from the subjects and from their employers respectively.

No one supposes that the authors of these studies felt satisfied with the completeness of their criteria. I have said that in field studies you have to be content with the criteria you can get. No doubt they obtained all that was practicable in terms of the time, financial resources and administrative machinery that were at their disposal. But the three studies show interesting contrasts. Thorndike's choice of criteria must clearly have been influenced by certain lines of thought which may be expressed as follows. "I must have as one of my criteria something quite objective which all subjects can supply. Earnings are popularly regarded as an index of success and I do not gravely dissent from the popular view. Next I want an assessment of factors which I, as a synoptic onlooker, consider to be characteristic of jobs held by people who are making a success of their work. Finally I want to express the individual's viewpoint by an estimate of his feelings of satisfaction." One detects in this study an assumption that vocational success is something more akin to vocational progress, less a matter either of achievement or of feelings and attitudes, than a position on a socio-economic scale.

Dr Earle's London experiment report was less extreme. He, too, took two popular objective criteria, but he based the remainder of his assessment on ratings. He was ready to see that success can be judged from two points of view, the employee's and the employer's, and that these may differ. In the NIIP follow-up, judgement of success was restricted to only one opinion— a self-assessment, which was made side by side with an estimate of vocational happiness. This may partly have been due to the obstacles in the way of obtaining estimates of success from any other informant. But it may equally be attributable to the fact that in this particular study, since vocational guidance cases tend to be handled on a purely consultant-client basis, it was the client's feelings of well-being and satisfaction that principally engaged the consultant's attention.

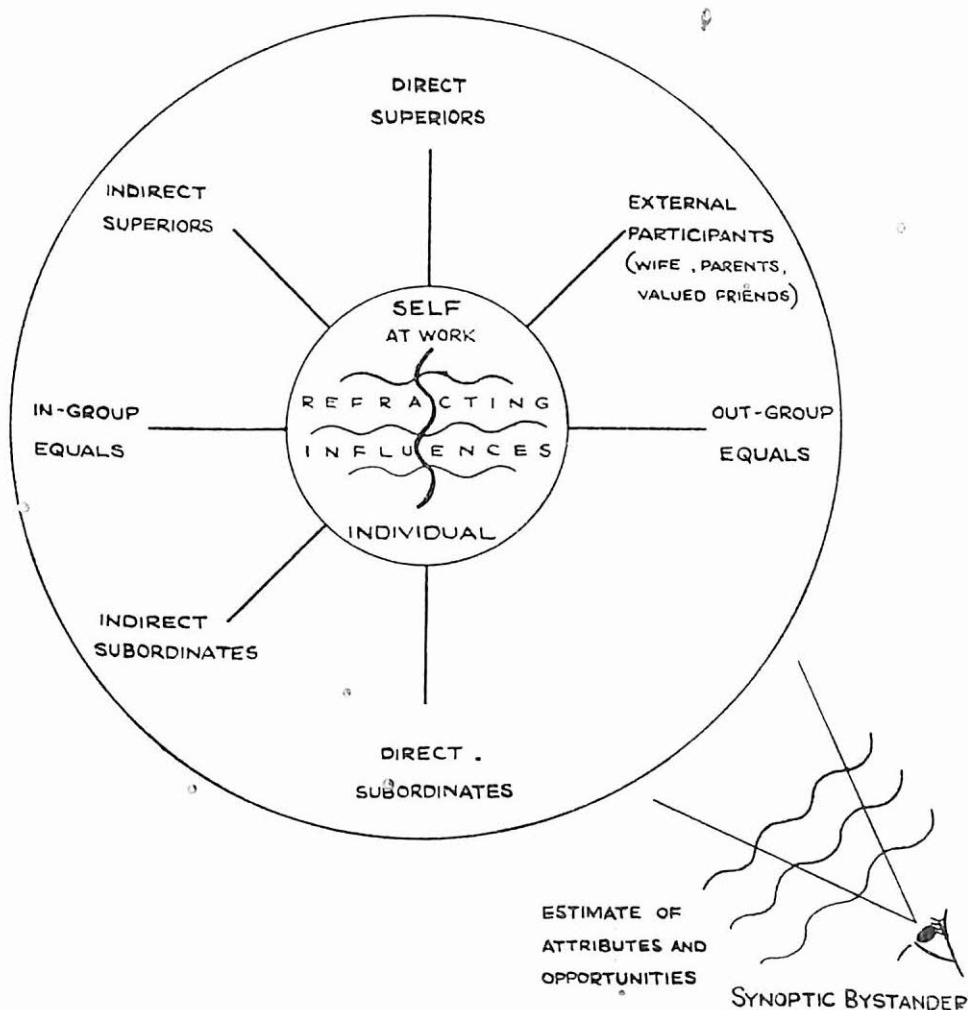
In a most interesting symposium on the criteria of vocational success Viteles (1936) dealt hardly with Thorndike's criteria, not because they seemed to him inadequate, but because he was dissatisfied with Thorndike's method of combining them into a single estimate. My own criticism is that they are not criteria of success, only of socio-economic status and vocational satisfaction. I do not quarrel with the principle of taking self-assessments as a means of judging occupational happiness; and I accept the principle that occupational success should be judged from a variety of standpoints. It is the number and nature of these standpoints with which investigators have (willingly or unwillingly) been content that lead me to doubt whether a full assessment of occupational success has as yet been attempted.

At this point, having already drawn a distinction between proficiency, adjustment and progress, I should try to define occupational happiness and success. Both, in my opinion, are questions purely of feeling and attitude. The former reflects those feelings of satisfaction or dissatisfaction experienced by the individual in relation to himself at work. The latter is more complex. It is a pattern of attitudes built up towards a worker by himself and by those

who have a claim to judge his performance in his working role. Conventional yardsticks, such as earnings or symbols of status, may well have their place in studies of success. But success or failure, as befits such emotionally-toned words, rest on an emotional basis. Success suggests the feelings of satisfaction consequent on appreciation; failure the feelings of distress consequent upon recognized inadequacy. Both are social phenomena. Appreciation and recognition involve the participation of others. Their attitudes, whether the pattern be consistent or inconsistent, must be the constituents of the appreciation or recognition of deficiency which form the basis of success or failure. The individual's self-regard is one important element in the pattern, but it is in its turn influenced by his interpretations of the feelings of others towards his work and his personality.

Where ratings of success have been taken, they have almost always been those of superiors. As Vernon and Parry show, sometimes several judges at the same level have given independent opinions, sometimes several judges at different levels (for example, the rating conferences used in the Army's operational follow-up of other ranks). It is the ratings of supervisors, executives, superior officers, teachers, that we find in the literature. But surely this is a very limited view, even when we recognize the uneasiness of authority in real-life situations towards the expression of judgements (which may be published) by people who do not bear responsibility for a man's work. Let us take a foreman in a works composed of five shops. Is his success in this role really to be determined by what his superintendent, the works manager and he himself feel about him? Surely the attitude of his subordinates must be included. His success or failure must be partly grounded in what the charge-hands and workers feel about him. Then there are the impressions of the foremen of the other four shops, his equals and perhaps his competitors for advancement. Perhaps he has to co-operate with certain specialists who are not in the direct line of authority. The views of the personnel manager, the time-study technician and the works chemist may have a bearing on the way he sustains his role. Finally is not his work and his judgement of his own performance much influenced by its relation to the expectations of people outside the works? What his wife expects—or, with young people, what parents expect—and how his friends regard his job must help to create standards to which he refers the nature, status and rewards of his work.

We have next to consider the distortions which psychological irregularities in the individual's personality may cause in his attitude to his own performance. Distortion is perhaps a less suitable term than deviation in this context. For what we mean is a departure from some conventional series of norms or standards by which we think it reasonable to judge success or satisfaction. In the *Occupations* symposium, Kurt Lewin (1936) points out the importance of levels of aspiration in assessing vocational success. A lawyer, efficient, respected, professionally well equipped, financially prosperous, may suffer from a too lively super-ego which forbids him to admit and enjoy success. A young trainee, apparently making good progress, may displace on to his job feelings of frustration or anxiety arising from difficulties in sexual adjustment or in establishing adult relationships with his parents.



The minor pathological elements which many of us carry without gross maladjustment may lead to an acceptance of less than we could hope for or a rejection of accomplishments which would be expected to satisfy. It is precisely the irrationality of these deviations that leads investigators to look for objective yardsticks, even if, like earnings, they are incomplete and not always strictly comparable. And they lend force to the desire to bring in the standpoint^o of the synoptic bystander who wishes to judge performance in relation to potentiality without too much interference from emotional expressions which seem unrealistic.

It is in the techniques which appear in sociometric studies that we see something suited to a more comprehensive appraisal of occupational success. It would be most interesting to see whether a small group of people could be assessed by ratings in accordance with the diagram which illustrates the concepts I have described. This system shows the desirable sources of assessment for someone who is in the middle of a hierarchy. With the appropriate omission of ratings by various parties it could probably be applied to a very

wide range of roles, although a different design would obviously be needed for a practitioner whose work was based on a consultant-client relationship. It should not be hard to appraise small working groups on parallel lines.

It is true that a big range of ratings or opinions would be yielded which it would be difficult to combine or to weight. But the essential difficulty is no greater than that of attempting to combine, say, Thorndike's three criteria in a defensible manner. By taking self-assessments and the opinions of superiors independently and comparing them with the assessments of equals, subordinates and external participants, we could begin to appraise the extent to which studies based primarily on the former are in error. And especially if the subjects were persons whose work depended largely on role playing, we should learn something of the peculiarities which often enable persons of quite moderate skill and knowledge to be accepted as holders of key posts, in preference to men of greater talent and attainment.

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WHAT IS OCCUPATIONAL SUCCESS?*

M. B. STOTT

WHAT IS OCCUPATIONAL SUCCESS and how can it be measured? Frequent attempts to answer the second part of this question have in the past met with only a modicum of success because no satisfactory answer to the first part has been clearly stated.

The word 'successful' is often used in ordinary speech about a man with regard to his occupation and is commonly understood; but fuller consideration of its meaning reveals that it is used in different senses by different people and that it means different things in relation to different occupations. By a successful business man is usually meant one who has made a good income out of his business transactions; a successful surgeon is one who cures often and kills seldom; a successful burglar is one who escapes detection. True, both the surgeon and the burglar secure financial remuneration from their activities; but it is not the surgeon's annual income which constitutes his success in the eyes of his patients; nor does the householder of moderate means, whose silver watch and spoons have been 'lifted' in the night, consider the burglar as less successful than one who has got away with £10,000 in his first jewellery haul, and possibly gets caught at his second. Nor is the social worker less successful when, on marriage or retirement, she transfers from paid to voluntary work. Financial reward then is not an essential concomitant of occupational success.

Some people may regard regular promotion to increasingly responsible posts as an index of success. Such promotion, however, while indicative of success, is not essential to it. A teacher is not the less successful as a teacher because his interest in his work and the personal contact with the pupils prevents his applying for administrative positions in the educational world. For some professions, too, and for the self-employed in general, there is no promotion possible.

To the employer success commonly means efficiency on the job—quantity and quality of output. Taking the employer in the widest sense to include customers, clients or patients, as well as the employer of salary or wage earners, quality becomes relatively more important since the customer, client or patient is interested in the one transaction rather than in the sum total.

To the worker himself success usually implies the attainment of some goal, whether economic or emotional. The goal may be the weekly pay

*Reprinted from *Occup. Psychol.*, 1950, 24, 105-112.

packet; the attainment of a certain standard of promotion, e.g. to foreman or works manager; the satisfaction of some interest, e.g. science or electricity; or the creation of something useful or beautiful; or the attainment of friendship, respect or admiration from his fellows or helping the community or the individual, e.g. in social work. The possible goals are legion and may change in any one individual in the course of his occupational life. The fact that he has not attained the goal with which he started out does not necessarily mean that he has been unsuccessful. A teacher may have started out with the hope of becoming a director of education; but his work among boys and the interest that he has derived from seeing their development may inspire him with zeal for more direct educational work and he may decide to remain as a teacher in a primary school; or his interest in assisting the maladjusted and problem boys who occur sporadically in his work may inspire him to apply for work on the staff of an approved school or borstal. In attaining this he is successful in achieving his new goal; nor can he be regarded as unsuccessful in his teaching profession if he decides to become a probation officer, an educational or vocational psychologist, or to adopt any other profession for which teaching experience may be directly or indirectly useful. If he gives up teaching altogether for an entirely unrelated career, such as the stage or the Bar, there may be some reason to suppose that teaching was not the best choice for him, though even so he may have been successful, in the sense of being proficient, in his teaching profession.

But a worker may be unsuccessful in his own eyes while being successful in the eyes of his employer, his vocational adviser or the world in general. If success depends upon the attainment of his own goal, the fulfilment of his own purpose, he may be unsuccessful because he has set himself too high a goal, a goal which belongs to the world of phantasy rather than of reality; or one outside the occupational field.

As an example of the first, a boy of mediocre ability and somewhat poor school record may set himself to achieve professional status in the engineering world. He may be a good and competent mechanic, and be giving full satisfaction to his employer; but he is unsuccessful in attaining his own goal because he has not the capacity to do so. Can we, therefore, say that he is unsuccessful in his career as a mechanic? Such was the case of Sam who reported that engineering was not a satisfactory career for him because progress was difficult owing to the part that 'graft and corruption' play. In fact, this boy appeared to have reached his own ceiling if the measurements of his abilities at the time of his vocational guidance consultation were correct.

To the world of phantasy goals belongs the girl of mediocre appearance, poor speech and no histrionic gifts who visualizes herself as a great actress; this does not make her unsuccessful as a clerk or typist, although she may be dissatisfied with her lot. To the extra-vocational goals belongs a man who wants to get rich quickly in order to retire and indulge in his own non-vocational interests, e.g. to go into politics or to travel. He may feel himself unsuccessful because he has, in fact, attained only a position which brings in a reasonable income for his age.

To the industrial psychologist the definition of success depends upon the particular problem being studied. The effect of a training scheme for apprentices, for example, the purpose of which is to make more efficient workers, may adequately be measured, in general, by increased quality and quantity of output. If the workers trained under the new scheme produce more or better goods than their predecessors they may reasonably be regarded as more successful for the purpose of the particular study being made.

The vocational adviser is primarily interested in adjustment to work. Financial rewards, promotion, output, etc., are not of primary importance. The errand boy who delivers his goods correctly at the promised time, who is cheerful and courteous and enjoys his work may well be better adjusted than the medical practitioner who would prefer to be an engineer. On the material level, in terms of income, dignity of position, standard of life and measure of responsibility, the man who becomes a bishop at forty-five is more successful than the one who remains a curate at sixty. But the curate may have attained his goal and be deriving great satisfaction from the comfort that he can bring to the poor and unfortunate members of the community; he may be doing extremely valuable work very well; he may be a successful curate; while the bishop may be an unsuccessful bishop.

Davies (1950) referred to adjustment in a way that seems to suggest that the vocational adviser regards adjustment and success as synonymous terms. Later he states that the vocational adviser, like the doctor following up cases of rehabilitation, 'is concerned entirely with the material and emotional satisfaction which the employment may provide for the worker'. This appears to imply that to the vocational adviser material and emotional satisfaction constitute adjustment, and hence presumably success.

I do not agree that the vocational adviser, like the doctor, is concerned entirely with such satisfaction, if by 'entirely' Davies means 'to the exclusion of other interests'. One must take into account success which, in my opinion, is not synonymous with adjustment nor with material and emotional satisfaction. In fact studies of follow-up of careers made by the NIIP (Stott 1939) used the terms 'successful' and 'happy' as a criterion of adjustment. Those who were either unsuccessful or unhappy were regarded as unadjusted. This suggests that while success is an essential concomitant of adjustment, the two can, in fact, be theoretically distinguished. In practice obviously it may be difficult to distinguish them owing largely to a possible halo effect, particularly if the information obtained about both success and happiness comes from the worker himself. In follow-up studies in progress at the NIIP*, workers are asked to grade their happiness and success on three-point scales: (a) Like the work very much, (b) Like the work generally, (c) Do not like the work; and (d) Good at my work, (b) Getting along quite well, (c) Finding the work difficult. The effect of halo is not very obvious in the answers given, since many persons do not, in fact, give the same grade of reply to the two questions, and the comments that they make show that they have no difficulty in distinguishing the two.

*For reports of follow-up studies by Miss Stott, see this journal, 26, 158-168, and 30, 137-152.

How, then, can we assess the degree of adjustment to work and how does it relate to the answers to these two questions? Adjustment involves something more than the satisfaction of the worker, the sense of well-being. It involves some measure of success; but we cannot say that it is necessarily directly proportional to success. The individual who reports himself as enjoying his work *very much* and doing *fairly* well may be showing a perfect adjustment to his work, even though he is only *moderately* and not *very* successful. The adjustment would only be regarded as imperfect if his success were less than his abilities would appear to justify.

Moreover, the adviser, unlike the doctor interested in rehabilitation, must take something of the point of view of Davies's 'synoptic bystander'. It is an essential part of the adviser's work to try to ensure that any talent the person may possess is used to the best advantage of the community. For example, a young man in his early twenties who consulted the NIIP about his career had been convinced through a succession of failures (all of which were due to extraneous causes) that he was fitted only for a labouring job. He was found to have first-rate intellectual capacity and mechanical aptitude. It was an essential part of the adviser's work to get him to realize and accept this, and to persuade him to endeavour to use it to the full in his occupational choice, partly because in the long run it was likely to be more satisfying to the young man himself, but also in order that his high ability should not be wasted. At all times the best use of man-power is essential to national economy and is the concern of the vocational adviser. There is, perhaps, a slight difference in emphasis of interest according to whether the adviser is a consultant called in by the worker or his parents, or an employee of a public body such as an education authority; but the difference is one of emphasis only; it may be compared with the difference between the general practitioner and the medical officer of health in their interest in a case of poliomyelitis. It would not be true to say that the former is interested solely in the patient and not at all in the prevention of an epidemic; but there is a shift of emphasis in the major concern of the two.

COMPONENTS OF OCCUPATIONAL SUCCESS

I suggest that occupational success can be described in terms of progress, competence, satisfaction, fitness and adjustment.

Occupational Progress

I propose that this term should be limited to upward progress towards increasing responsibility. It may be measured in terms of profit, wages or income derived from the occupational activities; in terms of promotion, or possibly the attainment of special fame, e.g. Michael Faraday in the electrical world. It is in this sense that the office boy who has become a big business magnate has been successful. It is the difference between the curate and the bishop, the primary school teacher and the educational administrator. In comparing the relative progress of individuals or groups of persons for the purpose of vocational guidance validation, it is, of course, necessary to keep age and experience constant.

Occupational Competence

By this I would mean the satisfactoriness with which the worker performs his duties. This is, perhaps, a more difficult thing to assess in practice, yet from the point of view of vocational guidance, or even of vocational selection or training, it is important. In certain industrial processes it may be measured by quantity and quality of output, and hence, if the worker is on piece rates, by the pay packet. It follows, therefore, that if earnings are taken as a measure of occupational competence, care must be taken to ascertain whether increased wages are due to increased output, i.e. to greater competence, or to promotion to a post of higher responsibility, i.e. to progress as defined above. But for many occupations, and especially the professional ones, output cannot be directly measured. An increase in the number of patients who register with a doctor under the national scheme argues for popularity; but popularity may be due to qualities of personality which are not necessarily indicative of great professional proficiency.

The report of an employer or supervisor may, at times, be taken as a measure of competence; but many previous publications have shown the unreliability of such reports. How, for example, can one estimate the competence of the nurse about whom the following reports were made by the sisters of the different wards where she worked?: (1) 'interested, keen, quiet and quick in her duties'; (2) 'rather slow and needs constant help but tries hard'; (3) 'extremely nervous; should improve; nice, gentle and kind; should make a good nurse'.

In many occupations there are no employers or supervisors; even where there are, competence may be better measured by the opinion of someone else. As Davies pointed out, in assessing the competence of a foreman the opinion of the workers under him might well be taken into account. The competence of a salesman in a manufacturing or wholesale concern may commonly be measured by the number of new customers he secures for his firm, or by the total financial value of his transactions. In a retail business, however, the opinions of the customers regarding the salesman's courtesy and helpfulness would probably give a more adequate measure if they could be obtained. The competence of a teacher may be assessed by some parents in terms of the examination results of her pupils; by others in terms of her discipline; by others in terms of the way in which she develops the character and personality of her pupils; and by others again by her skill in handling the backward or problem child.

Occupational Satisfaction

This refers to the sense of well-being experienced by the worker himself. I suggest that in the main it should refer to emotional satisfaction, the enjoyment of work, the finding of interest in it. Emotional satisfaction, however, is dependent upon the attainment of the chosen goal, or at least upon progress towards it. It may be that the chosen goal is an economic one and that the worker concerned is voluntarily sacrificing immediate interest for the sake of a future objective, which may, in itself, be outside the vocational aim. This was exemplified by a young man engaged in a commercial enterprise who reported

that he would prefer to be an engineer, but felt that his present occupation offered better opportunities for quick financial return and hence opened the door more quickly for entry into the political world. He was satisfied with his choice of occupation even though he did not feel that it was giving adequate scope to his aptitudes and interests. He was, in fact, more interested in 'progress' than in any other aspect of occupational adjustment.

As Davies pointed out, occupational satisfaction may be seriously affected by conditions outside the occupational field. It is not unusual for a worker to complain of boredom, fatigue, feelings of frustration, etc., not because the work is, as he thinks, unsuitable, but because of difficulties at home, sexual maladjustment, phantasy ambitions or various personality difficulties. Indeed, occupational satisfaction depends to some extent upon emotional maturity, a condition which some people never achieve (Stott 1939). A man who has gone as far in his career as could reasonably be expected from the measures obtained of his abilities may be dissatisfied because he has not progressed to a level of responsibility which could, in fact, be held only by persons of considerably higher ability. He is dissatisfied, ostensibly with his career, but in reality with himself. Davies, quoting Kurt Lewin, drew attention to the effect on contentment of level of aspiration. A worker may be discontented because he has not reached the level (economic, social, measure of responsibility, etc.), which he has set himself as a goal; or he may be content with a position which is less than he could achieve.

Occupational Fitness

By this I mean the adequate matching of the person and the job. It can be measured only in terms of the three aspects already described, but need not be, and often is not, highly correlated with any one of them or with all three together. To assess occupational fitness it is necessary to take account of the seven headings known as the seven-point plan. Does the work the individual is doing use to the full his general intelligence and his special aptitudes, his attainments, his physique, his interest, his disposition, without making too heavy demands upon him in any of these directions? Is his work and its environment, material and social, of a sort to fit with his general pattern of life, home conditions, etc.?

To illustrate this point, let us consider two workers in the same industry, engaged upon the same process, receiving the same wage, and turning out equal quantities of equally good products. They have shown an equal degree of progress; they are equally competent in their work. But they may not be equally satisfied, because one may be more than satisfied with his lot having got further than he, in his modesty, had anticipated; while the other may be discontented because he has not reached the goal that he set himself, a goal which was, in fact, far beyond his capacity. Both may be equally suitable to the work by ability, interests and disposition, but they are not equally satisfied. They are equally fitted, provided there is evidence that they have both, in fact, reached as far as their abilities would justify.

But what is this evidence that they have done so? Obviously only the measurements which exist of their ability and aptitudes. And here we

come across an apparently paradoxical position. It is the fitness which is the real purpose of vocational guidance; yet it cannot be taken as a measure of the validity of vocational guidance because by definition it presupposes the validity of the original measurements. But this is not entirely so. Let us look again at Sam, who was engaged in an engineering trade and reported that he was not happy in engineering because of his lack of progress. Records made at the time of his vocational guidance consultation suggested that he was not likely to have progressed much beyond the stage that he had reached when we had the report from him. He was of mediocre ability and great progress could not be expected. In terms of the four definitions given: he had not shown very great progress; so far as we know he was competent in the job he was doing; but he was not satisfied because of his want of progress. Have we any real measure of his fitness? The fact that his level of progress was in accordance with the original forecast of the adviser, and bears out the measurements obtained of his ability, is some evidence for the accuracy of these measurements; and it seems probable that his only moderate level of progress was, in fact, due to his mediocre ability and not, as he believed, to 'graft and corruption'.

Let us take a contrasting case, Tom, whose assessment of occupational fitness clearly does not assume the accuracy of the adviser's measurements of ability. Tom took an apprenticeship in mechanical engineering; he has done well at all stages both in his work and in his studies; he has passed all his examinations at the first attempt, coming out top in several of them, and winning a scholarship for further study. When last heard of he was well on his way to his national certificate. He was extremely happy and very glad that he had been advised to take up the work.

This boy is obviously occupationally competent at each stage; he has shown progress in that he has passed his examinations and passed on regularly to progressively advanced stages; he is certainly satisfied; and I think we must regard him as occupationally fitted. A study of his records at the time of his vocational guidance consultation shows that he has followed very closely the course recommended for him; but he has made much more rapid progress, and been much more competent, at each stage, than could have been expected from the original measurements of his abilities. This discrepancy obviously does not mean that there is any degree of occupational misfit, but merely indicates that the original assessments were wrong. They were wrong only with regard to level and not with regard to kind, since it seems fairly clear that Tom is progressing up the right ladder.

One can be less sure that Sam is on the right lines; one can only say that there is no evidence of an occupational misfit. Where progress, competence or satisfaction is low, comparison between the occupational history and the original measurements and assessments on the seven-point plan throws light on the question of fitness, but the evidence in this case may be inconclusive.

Occupational Adjustment

By this I would mean occupational fitness accompanied by an acceptance of this fitness by the individual. This does not mean that there is necessarily complete emotional satisfaction. The individual may still be hankering for something which he knows to be either beyond his capacity, or impracticable for one reason or another. But so long as he consciously accepts this fact, and recognizes that his present work is, in fact, in accordance with his own abilities, aptitude, interest and disposition; that it offers the best opportunities available for him in the *existing* field of occupations, then I should regard him as occupationally adjusted even though his progress is not outstanding and his emotional satisfaction is only moderate.

In conclusion I would suggest that the word 'success', like many ordinary words adopted in psychological usage, has acquired so many meanings that it has ceased to be meaningful, and that its use should be discontinued in psychological discussion. If it be used at all, I would limit its use to the attainment of the self-chosen goal. It follows, therefore, that, if this sense of the word is accepted, no man can be called successful unless something is known of his personal ideals and ambitions.

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WHAT IS OCCUPATIONAL SUCCESS?*

JOAN WYNN REEVES

INTRODUCTION

MR DAVIES, resilient enough to travel hopefully whatever the end, savours the delight of uncertainty and places the identification of unchallengeable criteria in the remote future. From reviewing some ways in which occupational success has been, and might be, assessed he derives suggestions about the term's meaning. He stresses its emotional basis and takes it to refer to a pattern of attitudes built up towards a worker by himself and by those who may claim to judge his performance in a working role. Davies is distinctive in wishing, I think rightly, to widen the range of those who might reasonably be asked for considered opinions on another's working performance. Who these might be is shown in Davies' diagram.

Miss Stott, impressed with the practical difficulties that occur in attempting to validate selection or guidance procedures with insufficient prior thought, implies that it is wise to be clear about what one is trying to measure before beginning. One hesitates to challenge an approach based on extensive experience but it is doubtful if her view can be wholly accepted. Theoretically, there is clearly something to be said for thinking that its mode of assessment should be considered in defining a concept. In practice, arm-chair analysis of what one means by a term, however interesting and worthwhile this may be, is very difficult; the actual search for data or for evidence relating to competence in work has a salutary effect on philosophic ruminations. Miss Stott might not have drawn some of her interesting distinctions but for time spent analysing people's work histories, without necessarily being clear in advance on what was 'a good work history'. Her distinctive contribution lies in proposing that 'occupational success' should be replaced by the five terms 'occupational progress', 'occupational competence', 'occupational satisfaction', 'occupational fitness' and 'occupational adjustment'.

DAVIES' 1950 ARTICLE

Three comments seem justified on this. First, Davies is not quite courageous enough as a traveller. If he accepts the full implications of defining success in terms of a pattern of attitudes, then vocational psychologists must travel for ever; for in seeking criteria of success they seek a changing goal. The attitude of a worker to his own performance in a working role, and the

*Dr Reeves' original article (*Occup. Psychol.*, 1950, 24, 153-159) has been shortened for publication in this form.

attitudes of those who can claim to assess his performance, are likely to change with chronological age, with differences in culture pattern (in the anthropologist's sense) and with the era in which the worker's record is reviewed. A fifteen-year-old's attitude to his achievement, and to other people's, tends to differ from that of a man of fifty. If Ruth Benedict was right, a twentieth-century Dobu would be likely to have very different attitudes to another man's performance in a working role from that of a Pueblos Indian, to whom an impeccable townsman is: "A nice polite man. No one ever hears anything from him. He never gets into trouble." He is one who avoids office, his Zuni culture tending to bar anyone who is distinctive or who attempts to lead.

Within western culture, some fascinating discussions would seem likely if, for instance, Aristotle, Joan of Arc, Machiavelli, Shakespeare, Johnson, Goethe and, shall we say, Bernard Shaw's publishers, Sidney and Beatrice Webb met among the direct and indirect superiors (in- and out-group equals?) contemplating Shaw's occupational success. Mrs Shaw, Ellen Terry, Leigh's Androcles (with the lion as indirect subordinate) could perhaps complete Davies' Druid circle. Whom to make the synoptic bystander is less apparent.

The point of suggesting differences in attitude which might arise with variations in age, culture and era, is that vocational psychologists do not need to seek 'unchallengeable criteria' of occupational success. If satisfactory criteria could be found for use in a limited context for a limited time, that would constitute a step forward. That the criteria advanced should be constantly reviewed is not alarming.

Secondly, apart from the snags (such as finding suitable onlookers) that appear when one thinks of occupational success on the grand scale, Davies seems to have spoilt the otherwise useful conception of a bystander by apparently limiting his interests to the use of talents, in exemplifying them by intelligence and attainments. Clearly, a bystander could prefer the creation of a contented farmer to that of a prickly high order administrator, on the grounds that work of the latter sort, though more in line with this farmer's intelligence and education, was so out of line with other attributes (e.g. interests and disposition) as to incommode him seriously. He might even prove to be a short-term asset to society in a position of great responsibility. The synoptic bystander should be able to consider individuals as wholes although seeing them against a background of society's well being. This broadening of the bystander's outlook, however, raises many questions about what could or should guide his judgement. For example, how does Davies' bystander decide which are 'the most important and useful occupations'?

Thirdly, as it stands, the distinction Davies implies between the outlook of an employer and that of a doctor or psychologist following up individual cases suggests more of a *necessary* conflict of interest between the individual and society (as represented by an employer) than one hopes is justified. Where and when such conflict occurs in practice, as indeed it does, do we not either deplore the circumstances (as in war), or confound the employer for

being shortsighted, the psychologist for being unrealistic about a person's employability, or, alas, the individual for being egocentric? The vocational psychologist giving general advice, and not undertaking the additional responsibility of placement, has constantly to guard against unrealism.

MISS STOTT'S ARTICLE

Miss Stott recognizes the different senses given to 'occupational success' by different people and illustrates the different weight that may be attached, by members of different occupational groups, to financial remuneration, or to promotion to responsibility over a wider field. Though she wrote of this in 1945 she does not mention possible sex differences in occupational attitudes. Moreover, investigation might show individual occupational goals to be profoundly affected by different conceptions of the place work has, or should be given, in living as a whole, these in turn being related to wider differences in era and culture.

Some comments are justified on the five terms, occupational 'progress', 'competence', 'satisfaction', 'fitness' and 'adjustment' proposed as substitutes for 'success'. First, using verbs rather than nouns might have been safer. The practical need for better norms, relative to age, experience and different parts of the country, for *progressing* in pay, promotion (i.e. taking responsibility for other people's work) and 'attainment of special fame', would then be clearer. Some of the obvious difficulties of finding standards of 'special fame' might be avoided, if its attainment were seen as peculiar to certain occupations and as flying, usually, outside working life. Perhaps 'progressing in reputation' should be substituted. This, however, drives us back to considering Davies' pattern of attitudes and the problem of those in a position to judge performance in a working role.

Assessment of occupational competence also presents difficulties, for it too is a highly abstract term whose relations to observable facts need to be determined. However, much has been done, for example by psychologists in the Armed Services and the Civil Service Selection Boards, to improve assessment by using concrete descriptions of performance in the daily duties of a job in its setting. These, linked to some form of proficiency rating of skills as adapted to their use in a setting, have been shown to yield valuable data.

To the discussion of occupational satisfaction I have little to add beyond underlining the chances of change in levels of aspiration. More comment is needed on occupational fitness. It is convenient to consider fitness within the framework of the seven headings familiar to British occupational psychologists, but we should not too easily adopt a description only in terms of avoidance of waste and of making too heavy demands. Surely there should be reference to change and improvement? For example, would not work which encourages the widening and deepening of interests be thought more 'fitting' than that which suits an individual at a given moment but does not lead to development, even if at times this entails conflict? Here, particularly, one needs to think with verbs rather than nouns, about fitting rather than fitness, and to avoid conceptions which are static. Some stress on

development also helps in avoiding a theory of adjusting to work which puts a premium on absence of conflict in contrast to its skilful solution.

This insistence on development is not merely of theoretical interest. In practice, when assessing data on young people's work histories provided by employers, parents and the young people themselves, the need to distinguish present fitting from estimated fitting, and to allow for change in the work or in the young person, is important and by no means easy. If, however, no such distinction is made, available data will be interpreted differently and ratings by different investigators will not be comparable. For example, an A grading on a five-point scale given to a poorly-endowed youngster for present performance in the routine stages of a skilled apprenticeship, is not comparable with any rating either for the same person or for one better endowed when the future demands of the work are reviewed. Possibly it might prove useful to define overall fitting in terms of a series of temporary fittings, but this raises the problem (itself worth study) of the length of time ahead for which it is justifiable to hazard predictions.

The practical need for satisfactory evidence on the requirements of different occupations is beginning to be met. For example, some evidence of the mean intelligence levels (as indicated by the twenty-minute version of the 1938 Progressive Matrices Test) with which those entering certain broad occupational groups would at least have to compete was provided by P. E. Vernon's analysis of the scores of 90,000 candidates for the Royal Navy (Vernon, 1949). Systematic validation of the Civil Service Selection Board procedures over a lengthy period (such as twenty years) should yield valuable evidence of occupational requirements.* However, the amount of research needed to produce validated job studies of the range of work considered in vocational guidance, and keep it up to date, is vast.

A final comment on fitness can be made from a different angle. Miss Stott cites two workers allegedly equally suited by interest and disposition to the work they do, but one in his modesty is more than satisfied and the other is discontented because he has set himself a goal beyond his capacity. The discussion suggests that either the seven-point framework is inadequate because it leaves out those significant orrectic factors which distinguish these two workers, or that interest and disposition have not been given enough weight. A closer look at these two headings, with the necessary allowance for change and development, shows that we cannot define occupational fitting, at any rate according to the seven-point plan, without some reference to occupational satisfaction. Set out more fully, questions about matching a person's achievement and estimated potentiality might read as follows:

How far has the person's occupation been:

- (i) Utilizing and developing, but not beyond, his physical endowment?
- (ii) As adequate economically, socially, geographically as current conditions permit and his responsibilities and ambitions require?

*See for example Anstey, E. A. (1971) and the references given there for specially relevant publications since this article appeared in 1950.

- (iii)
and
- (iv) Making full use of his general intelligence and special aptitudes without being beyond these*?
- (v) Utilizing attainments (if so, which) and adding to his experience and qualifications?
- (vi) Satisfying his interests (if so, which) or allowing their satisfaction outside work; encouraging the formation of new and wider interests?
- (vii) Utilizing dispositional assets (if so, which); minimizing weaknesses (if so, which); encouraging personality development?

Were it possible to include so much under occupational fitting, it could then be useful to describe occupational adjusting, which admits of degrees, in terms of acceptance by an individual of the degree of fitting he has obtained in the past and present and of his prospects of fitting in the future.

*Add in 1970: or precluding such development as might be possible.

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WHAT IS OCCUPATIONAL SUCCESS? POSTSCRIPT 1970

JOAN WYNN REEVES

THREE ADDITIONAL COMMENTS may be made in 1970. Nowadays one would lay greater stress on individual differences not only among people choosing work but among those, including psychologists, attempting to assist them. The amount of agreement between the three psychologists writing in 1950 is striking, so also is the large extent to which one can still agree with what was said. Nevertheless there are interesting differences in the writers' underlying attitudes, for example in the resilience with which they approached uncertainty, or achievement and its likely occurrence. Such differences in attitude are variables long recognized to be of importance in reviewing selection or guidance procedures. One would expect their significance, however, to be more widely and readily appreciated in the current climate of opinion.

Secondly, it is noticeable that none of the symposiasts discussed failure as such. Yet it is often worthwhile to look at a problem in reverse to see if a key concept is then clarified. Inverting the question about 'occupational success', or any of the constituent processes (being competent, progressing, satisfied, etc.) suggested in 1950, brings two points into focus. On a short-term view, it is sometimes easier to find relatively clear-cut indications of failure where it exists than of any of the corresponding forms of achievement. For example, inability to hold down a job sought, offered and attempted implies difficulties (however obscure their exact nature may be) more obviously than success in any of its forms is shown by mere continuation in work. What is more, the psychological impact of success or failure may vary from person to person and for the same individual at different stages in his life. Each, considered over a long period, can be seen to enhance itself or contribute to bringing about its opposite. In fact, while apparently logical opposites, success and failure need not operate psychologically as such. This is important in studying work histories; for the timing and functioning of failures or of periods of success may be crucial to understanding a person's record and potentialities.

Comparable scrutiny of concepts such as adjustment or acceptance in an occupational context is also useful in underlining the negative implications that may carry most weight. To define 'adjustment' (or adjusting) in positive terms is notoriously difficult. Describing its occupational usage, apart from such broad indications as were given in 1950, is not easier.

Attempts are apt to provoke the question 'adjustment to what?' Rather less hazardous may be the search for criteria of maladjustment in a work situation. It would be exemplified when the frustrations, problems and conflicts of a person's job as he sees them (together with those of which he is less fully aware) contribute to his using defence and allied mechanisms to an extent that increases the occupational difficulties he has to face. Such interpretation can be seen to emphasize the person's own point of view rather than implying direct comparison with some supposedly fixed independent evaluative standard. In the 1950s, 'adjustment', though criticized, was still a commonly used term. Currently, 'acceptance' is in wide circulation with a positive connotation that is extremely vague. Its opposite, however, may be exemplified by inability to assimilate unalterable facts, by pathological denial of them or their implications or by the gnawing self-hatred that can deter a gifted person from realizing his potentialities and lead him to hating himself the more. These negative possibilities and their tragic significance come into focus if use of the term acceptance is inverted.

My third comment extends those made in 1950 about changing criteria and goals. To my knowledge, no answer has been given to the question raised concerning the length of time ahead for which prediction may be reasonable. Changing circumstances and individual differences would obviously preclude a final one. Meanwhile, the nature of the question might be clarified if the term 'goal', used rather freely in 1950, were confined to relatively short-term and clear-cut aims and the more general concept of direction were used when an inherently less definable (because changing and developing) working role in life is under review. 'Goal' suggests something fairly specific. Some people rightly or wrongly seem to seek or have to seek immediate achievements. However, many young people's approaches to working life do not justify this specificity, particularly if they are searching for some form of self-definition in what they do. Naturally there are exceptions, illustrated by those with highly-specialized gifts or interests, e.g. in music or mathematics, which are apparent early and from which a whole life's work may gradually develop. Also there are those whose indecisiveness is in itself a problem. Often, however, an able eighteen year old explores or withdraws step by step in a general direction and one with too specific a notion of his goal at forty gives the onlooker pause. With older people, too, the possibility of change and development, whether positive or negative, can call for re-consideration during their lives of what immediate route to take in a wider and less defined direction. Advising, at any stage, can thus amount principally to aid in providing evidence and in drawing out its implications so that short-term decisions do not set needless limits to long-term range of action.

Such a distinction boldly drawn between relatively specific goals and broadly indicated directions, within which there may be paths to explore or to avoid, might clarify what it is reasonable for vocational psychologists, or other advisers, to have in mind when considering choice of work in a rapidly changing environment. The upshot of exploration cannot be specified in advance: perhaps the style of journeying is the true measure of skill.

WHAT IS OCCUPATIONAL SUCCESS?

POSTSCRIPT 1970

J. G. W. DAVIES

TWENTY-YEAR-OLD PAPERS are better evaluated by members of a younger generation than by their authors. A fresh professional eye spots the distinctions between then and now with sharper perception. This applies with special force when the author's work has not always obliged him to keep abreast in detail of the findings of research.

Reading the Institute's 1950 series on occupational success and then Dr Anstey's (1971) account of his follow-up studies in the Civil Service, one is tempted to conclude that the constraints of twenty years ago still bite as shrewdly as ever. Have psychologists in this particular field succeeded only in marking time?

It is, of course, improbable that some totally new concept to supplement occupational proficiency, progress, adjustment, satisfaction and success would be likely to emerge. Most of the basic standpoints from which performance at work can be considered had been identified long before 1950. New interpretations of the old concepts are feasible, but to add to them a wholly unfamiliar concept would be unexpected.

What is more surprising is that there have not emerged more new *types* of criteria to extend the five main types mentioned on the second page of my article: objective records of individual performance; differences between groups of known characteristics; results of examinations or tests of knowledge and skill; gradings and assessments; objective records of group performance. Within these types, of course, many sets of data not previously used as criteria must have been assembled and evaluated. Real-life situations are sufficiently diverse to ensure such a development. But innovations in the types of criteria themselves have been rare. An interesting example was Cronbach and Gleser's (1957) proposal to incorporate a cost factor into their statistical model for the validation of selection procedures. I doubt the wisdom of intermingling administrative considerations with variables derived from procedure and performance, but it was an original stroke. Yet even here cost cannot serve as a criterion in the absence of measures of performance.

Statistical method has assuredly advanced since 1950 and such techniques as cluster analysis may help to systematize data in a way which was then unfamiliar. The statistical training given to psychologists has also become more rigorous and extensive. The spread of computer services enables the psychologist to contemplate programmes of computation and

analysis which were unthinkable in 1950. But, however wide the repertoire of mathematical tricks and electronic devices, there appears to remain an element of intractability in the problem of how to make criteria of performance tractable.

The three articles on occupational success served as a reminder of the limitations which so often restrict criteria of performance and which are sometimes too lightly set aside. In this sense it may have the same salutary function as Holdsworth's (1971) paper, reminding psychologists of the assumptions on which certain statistical techniques are based—such as linearity of relationship and normal distribution—and which are sometimes conveniently ignored.

To devote resources to studies which, if vigorously criticized, are from the outset condemned to be inconclusive is at first sight irresponsible. But psychologists who wish to combine a consulting or executive role with a scientific one must inevitably be faced with some very nice judgements whether or not a particular project can be so designed as to yield results that justify the time and money expended on it. For if they claim that their work is subject to the audit of true validity, and also aims, whenever possible, to extend knowledge, they are bound sometimes to admit the impossibility of establishing its validity and, if this happens too often, may risk loss of confidence in the minds of both their clients and their professional colleagues.

Finally upon reflection I adhere to the view that occupational success (as distinct from proficiency, adjustment, progress and the like) is something which can be assessed only in sociometric terms. As a *tour de force* it would be interesting to see one project along these lines carried out thoroughly, but it is not important for the central problem of assessing performance. It would be to explore a sociological concept rather than to yield parameters for the regular practical use of occupational psychologists.

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DEVELOPMENTS IN VOCATIONAL GUIDANCE

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A VOCATIONAL GUIDANCE SERVICE was first provided by the National Institute of Industrial Psychology in 1921, little more than a decade after the passing of The Education (Choice of Employment) Act. Its particular contribution in those early days was in developing a systematic approach to guidance focused at first on a battery of tests of general ability and special aptitudes. Follow-up studies of the pre-war period showed the value of this approach, which could be said to have influenced in considerable degree the kind of vocational guidance services set up in the state system.

Some thirty years later contributors to a symposium in this journal (Rodger, Lock, McMahon 1951) described some of the advances that had been made in vocational guidance in this country and reviewed the gaps in knowledge and techniques which they found. Their discussion centred on five major topics: the guidance interview, the use of tests, occupational information, validation and definition of the respective contribution of careers teachers, parents, youth employment officers, occupational psychologists and others to vocational guidance.

In that same year Ginzberg and his associates (Ginzberg *et al.* 1951) published the first attempt at a comprehensive theory of occupational choice. By suggesting that occupational choice should be seen as an aspect of general development they introduced, in contrast to Parsons' static matching of people and jobs (Parsons 1909), the notion of a dynamic adaptive process. This idea was further developed by Super (1957) with his concept of occupational life stages. As a result of his and Tiedeman's (1961) work it is now appreciated that occupational choice is not a career decision made at one moment to last a lifetime but rather a sequence of decisions extending from the fantasy choices of childhood to those involved in retirement. Thus the function of the interview in vocational guidance has changed; workers in the field now see its purpose as helping an individual to appreciate how far he has progressed in his vocational thinking and to take stock of his present situation in order to plan for the future with a flexible outlook.

The implications of this change are recognized not only by vocational advisers of adolescents but by educationalists who are seeking to prepare children for the realities of adult life (Daws 1968); by the Department of Employment nurturing the Occupational Guidance Units and putting forward proposals for an all-age guidance service; and by employers who are taking

increasing responsibility for career development by introducing appraisal schemes. The value of such continuous appraisal is being brought home by the growing numbers of workers who have to reassess their employment potential because of economic, technological and organizational changes as well as the changes in attitude and skill that accompany ageing. The idea that vocational guidance interviews should be a series spread out over time meets the needs arising from the changing character of occupational life.

The vocational guidance interview has altered in other respects through the growth of counselling psychology. The dramatic impact of Carl Rogers' writings (1957, 1965) focused attention on the nature of the relationships in a counselling interview. Rogers' ideas were modified and related to the vocational guidance interview by Super (1957), Tyler (1961) and Wrenn (1962) and are reflected in the establishment of counselling courses at a number of British universities. The client is no longer assigned the role of a subject passively assessed and advised, but that of an active partner learning to take full responsibility for the definition of his situation and for the development of realistic vocational plans. Since the interview is not now expected to serve as a once-for-all assessment, its opportunities for encouraging personal growth and mature decision-making can be freely utilized.

Perhaps the most important event in recent years concerning tests has been the setting up by the British Psychological Society of standards for test usage (BPS 1960, 1965, 1969). This has not only encouraged test construction to be carried out more rigorously and test administration more stringently, but has set standards by which any test can be evaluated. The trend is toward a greater professionalism which can protect test constructors, test users and test takers.

Against this background current test developments are likely to make a considerable impact on British vocational guidance. The battery being constructed by the Central Youth Employment Executive, for use by the Youth Employment Service, is likely to have the most far-reaching effect. It is envisaged that enough training will be given to enable non-psychologists to use the battery, thus extending the availability of tests for vocational guidance. Introduction of the new British intelligence test, to replace the popular but misused Wechsler Adult Intelligence Scale (WAIS), will offer those advisers who are qualified psychologists a more delicate measuring instrument for use with selected vocational problems.

The use of non-cognitive tests in vocational guidance has still to be fully explored although evidence has been accumulating on the contribution of non-cognitive factors to job success and job satisfaction. A follow-up of vocational guidance clients seen at the National Institute of Industrial Psychology (Lancashire and Cohen 1971) shows that cognitive tests could provide a kind of base line from which individuals might consider, and counsellors advise, certain occupations; but that non-cognitive factors, such as motivation, may be the ultimate determinants of occupational success. Awareness of the need for non-cognitive tests is reflected in the increasing popularity of Cattell's Sixteen Personality Factor Questionnaire (16PF),

despite the limited British occupational norms available.* Essays into interest measurement have been made with the Connolly Occupational Interest Questionnaire (1967) and the Rothwell-Miller Interest Blank (1968). The APU Occupational Interests Guide (Closs 1969) is likely to be the most widely used for the vocational guidance of the younger age groups but still needs further validation.

Not only are more and better tests becoming available for vocational guidance but advisers are developing a fuller appreciation of how tests can aid guidance beyond merely producing a score, or pattern of scores, for predictive purposes. Hopson (1968), in the course of a comprehensive review, suggests using them, for example, to stimulate responsibility for decisions by asking clients to choose what they would prefer to be tested on. Boreham (1967) and Phillipson (to be published) have shown that it is possible to gain information relevant to guidance from the strategies people use as well as from their test scores. This subtle use of tests demands considerable skill, far greater than that required in orthodox practice.

Helping someone to arrive at a more realistic picture of himself and his potentialities is only one aspect of vocational guidance. There is a need for realistic information about work upon which people can base their vocational decisions. Attempts have been made to build up more dynamic descriptions of work which reflect the psychological and sociological man as well as the economic one. For example, occupational information should include accounts of what it feels like to be in a given career and how society values it as well as the earning prospects it offers. Sociologists have made us aware that work roles have associated non-work roles, e.g. within the family or community, and that the satisfactions a job has to offer as a 'way of life' are as important a part of occupational information as the activities it entails and the abilities and aptitudes it demands. Hayes (1969) has pointed out difficulties in assembling information of this kind, but such studies as those of Cotgrove and Box (1970), Sofer (1970) and Sykes (1969) demonstrate that these difficulties can be surmounted.

The post-war period has seen advances in the development of job classification systems to help advisers and those advised to focus upon a suitable area for exploring job possibilities. Clearly if someone fits into one job he is likely to fit into others having similar characteristics. Moser, Dubin and Shelsky (1956) produced a modification of Roe's attempt to classify jobs by level (e.g. of responsibility and skill) and by the degree and nature of the social contact they required. A richer classification has more recently been developed by Holland (1966). This also is a 'level and direction' system but it classifies occupational environments according to the different strategies required for dealing with the work tasks; farming, for example, is environmentally different from social work. Holland's six kinds of environment—realistic (e.g. agricultural, practical-constructive), conventional (e.g. office-based, such as accountancy), enterprising (in the business sense), intellectual, social and artistic—can provide the occupational adviser with an 'aerial

*This situation is being improved through dissemination of information by the National Foundation for Educational Research.

view' of jobs, grouped by their common characteristics, which can be used to stimulate awareness of new possibilities and thus extend an individual's range of choice.

Until recently validation of vocational guidance has tended to follow the pattern of the early NIIP studies (Handyside and Stott 1958). The careers and job satisfaction of a group who had received vocational guidance were compared with those of a group who had not; or within a guided group the subsequent careers of those who followed the vocational advice would be compared with the careers of those who went against it. These studies consistently reaffirmed the value of systematic vocational guidance, especially when a battery of standardized tests had been used, and this has enabled vocational advisers to approach their work with a greater confidence but not with complacency.

It is clear that criteria will need to be reformulated if they are to reflect the shifts in objectives that have taken place. The work of Super and other developmentalists suggests that 'current job held' should be replaced as a criterion by the pattern formed by the sequence of jobs held from the point of the original consultation to the point of the follow-up. Super proposed that themes might be extracted from such sequences and classified as, for example, stable career pattern, or multiple-trial career pattern; and Tiedeman (1961) has suggested ways in which such job changes could be analysed, for example, by the kinds of position chosen, by their sequence, and by the duration of stay in each. Attempts have been made for other purposes to use both Roe's and Holland's classifications to chart job moves from class to class and this way of describing sequences of job moves could possibly provide a basis for a more dynamic criterion of job development. The centrality of self-image to occupational development has shown the possibility of developing a subjective criterion in terms of the goals a client had set himself and how he perceives and feels about what he has actually achieved. A further alternative arises out of the work of counselling theorists who suggest a criterion reflecting how a client has been able to use his consultation and whether he has become better able to deal with his vocational decisions.

A tentative start to developing more appropriate criteria has been made in as yet unpublished research (Lancashire and Cohen 1971). Two groups who had been vocationally advised some eight to twelve years earlier were studied. Each person's sequence of study and job moves was charted on squared card. Progress in a career, as shown, for example, by professional examinations passed and by promotion to positions of increasing responsibility, was represented by vertical moves; and faltering or changing direction by horizontal ones. A simple ratio of vertical to horizontal moves was calculated and it was found that people who followed the original vocational advice produced a larger ratio than did those whose subsequent patterns of work diverged from what had been advised. Another follow-up study (Farid-Uddin 1970) is distinctive in having been carried out nearly thirty years after the original consultation instead of after only a few years. The use of a computer in this study has made possible the exploration of many more variables and their relationships.

New and defined groups concerned with vocational guidance, such as careers teachers and school counsellors, are now emerging alongside the established careers advisory officers of the Central Youth Employment Executive. The careers teacher movement has developed with the formation of the National Association of Careers Teachers, an increasingly articulate pressure group whose aims include more and improved careers guidance in schools and better conditions in which to carry it out. However, there still remain head teachers and education committees unconvinced of this need and many careers teachers find that no time has been officially allocated in which they may carry out their work. Moreover, people who have completed counselling courses are often unable to obtain positions where counselling is their main function.

There is increasing agreement that schools have an educational responsibility to help pupils, over the years, to come to a realistic appreciation of working life, the satisfaction it can provide and the demands it is likely to make. However, the various contributions of the careers teacher, the school counsellor and the Youth Employment Service to individual vocational counselling have yet to be established. Central problems are, for example, who is to be concerned with counselling and who with placement; whether priority lies with individual or with national needs; who is to work with the group and who with the individual. Law (1970) points out the dilemma of whether a vocational adviser is primarily an agent for economic planning, whose function is to find manpower to fill available vacancies, or whether his first responsibility is to the individual, offering the sort of counselling which will enable a young person to make responsible decisions for himself. There are some who advocate that vocational guidance should be the responsibility of the school, treating the Youth Employment Service primarily as an employer-oriented placement agency. Others feel that an 'outside' agent like the Youth Employment Service could provide greater detachment and objectivity than a 'within-school' counselling service.

The theory of vocational guidance has greatly changed in emphasis in the last twenty years but the changes in practice are not yet so noticeable. In aiming at increased professionalism, vocational guidance is becoming integrated with the world of education and of employment, just as vocational guidance theory is now more closely linked with general counselling and occupational psychology. Thus vocational guidance can no longer be seen as a discrete service offered to young people at the conclusion of their full-time education, but rather as part of a continuous evaluation starting in school and continuing throughout adult life.

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VOCATIONAL GUIDANCE AT THE DEPARTMENT OF EMPLOYMENT: THE WORK OF PSYCHOLOGISTS

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INTRODUCTION

THE DEPARTMENT OF EMPLOYMENT is probably the largest employer of occupational psychologists in the United Kingdom. An outline of the various activities which engaged them was presented to the Annual Conference of the Occupational Psychology section of the British Psychological Society in January 1969 by the then Joint Parliamentary Under-Secretary of State at the Department (Hattersley 1969). The present paper expands and brings up to date what was said then about the involvement of psychologists in the practice and professional support of vocational guidance services. There are three public services provided by the Department in which vocational guidance is the essential constituent. The following sections say something in turn about each of them from the point of view of psychologists working in them.

YOUTH EMPLOYMENT SERVICE

Young people coming to the end of the secondary stage of education were the first section of the community for whom it was recognized that there was a need for a service providing not only help in finding a job and information about work opportunities but advice in helping to choose a suitable career. From the beginning, local education authorities as well as the Department of Employment (under its previous titles) have been involved and this dual responsibility is reflected in the organization at all levels. The Central Youth Employment Executive, responsible for general policy and administration, has eight members of whom three are from Education departments. Two of the senior staff of the CYEE are careers officers seconded from local education authorities. At local level some 85 per cent of young people are the concern of careers officers employed by local education authorities (with a 75 per cent grant from Department of Employment funds). The other areas are administered by the Department (CYEE 1970).

Traditionally careers officers (who used to be called Youth Employment Officers) have been concerned with:

*Any expressions of opinion in this paper are those of the authors and should not be attributed to the Department of Employment.

- (a) helping young people to choose work or training consistent with their capacities and inclinations,
- (b) providing information about work, training and education,
- (c) helping young people, by offering a placing service, to put a plan of action into effect.

This help is available to young people (and their parents) while they are at school and up to the age of eighteen. The methods available to carry out these tasks have changed considerably in the recent past and are likely to develop further in future. In contrast to the adult guidance services, careers officers work with all young people, not just those who ask for advice. They do not depend on what can be done in the course of an interview, supplemented by the results of tests and inventories, but have a time span of at least a year during which, with the co-operation in secondary schools of quickly increasing numbers of teachers with special responsibility for careers education, they can help students to learn about the world of work.

Throughout the history of the Youth Employment Service, the National Institute of Industrial Psychology has been closely involved in the development of technically sound methods for the assessment of the capacities and inclinations of individuals and the study of occupations. The earliest investigation aiming at an evaluation of vocational guidance procedures was that of Dr Cyril Burt, the first head of the vocational department of the NIIP. In 1923, 100 London school children were examined, and at the close of the inquiry all the data obtained for each child were collected together, and vocational recommendations made by the investigators in committee. A brief letter was sent to the parents, stating what form of employment seemed best fitted to their child. After an interval of about two years a special inquiry was carried out, to discover how many of the children had obtained employment of the type recommended, and to compare their progress with that of the children unable to follow the advice given (Gaw *et al.* 1926). The report encouraged a further experiment under Dr F. M. Earle, which included detailed school reports and the use of a number of tests (Earle *et al.* 1931). Further experiments in Fife (Earle and Kilgour 1935) and Birmingham Youth Employment Services (Hunt and Smith 1944), and the introduction of vocational guidance procedures in Preston and Warrington in the 1940s, put into operation a model which in some ways is still in advance of what is done in some other areas today (Reeves and Wilson 1949).

Of the occupational psychologists concerned with the Service, Professor Alec Rodger is pre-eminent in this contribution to principles on which it is based and to the training of both careers officers and careers teachers. Within the Department Gordon Whiting, another ex-NIIP psychologist, was for many years chief inspector of the CYEE, concerning himself with the propagation of good practices throughout the Service in this country, and in Northern Ireland when it started a youth employment service in the early 'sixties.

The first person to be appointed to the staff of the Executive as a psychologist was W. G. Brown (now at Aston University) in 1959. He did some inspection work but spent a great deal of his time on training. Since

1962 the work of psychologists has steadily increased, contributing in the first place to training of increased numbers of staff for the Service to cope with the 'bulge' of the 'sixties and with reduction in potential case load for careers officers from over 500 to its present 420. The new training unit, established in 1966, designed and set in operation by psychologists, was one of the first units to use closed circuit television for interview training, and it now provides for nearly 1,000 trainee-weeks per year. In that year also, the contribution of psychologists was recognized by the establishment of a principal psychologist post, the holder of which was also a member of the Executive.

At present there are four psychologists at the headquarters of the Youth Employment Service; two spend three-quarters of their time on training, two others are primarily concerned with vocational guidance research, monitoring what is being done in university departments and other research organizations, assessing its implications for the work of the Service and giving help to research workers not only about how the Service operates but also about other research being done and on the design of their surveys. They also carry out research projects of an applied character themselves, such as:

- the development of a rating scale for personal qualities incorporated in a revised school report form;
- an examination of the use of group discussions in vocational guidance;
- a study of the feasibility of the use of psychologists for the referral of difficult cases;
- the introduction of cognitive tests which are being developed by psychologists in the Assessment Techniques Unit of the Department of Employment;
- an occupational interests guide for use in vocational guidance.

The last has been developed by S. J. Closs of the Applied Psychology Unit, Edinburgh University, in part with financial support from the Department of Employment (Killcross and Bates 1968; Closs 1969).

The translation of research and development into practical techniques is achieved partly through training courses, partly through the publication of summaries of research describing implications for vocational guidance practice and partly through the introduction of new procedures.

The staff at Headquarters is supported at regional level by senior psychologists whose time is allocated to those areas of work concerned with all three of the vocational guidance services described in this paper.

INDUSTRIAL REHABILITATION SERVICE

Most people who have suffered illness or injury, even when left with a subsidiary disability, are able to return to their old jobs or to take up new ones on completion of their medical treatment. But there are some who need further help to regain working fitness, to recover confidence in their ability to do a full day's work and to discover a suitable type of occupation. It was to meet this need that the then Minister of Labour was empowered (under

Section 3 of the Disabled Persons (Employment) Act) to provide courses of industrial rehabilitation. Since the first Industrial Rehabilitation Unit (IRU) was set up in Egham in 1943 there has been a steady (and still continuing) expansion of the service and there are now twenty-four IRUs sited in the main centres of industry and population throughout the country, dealing with over 14,000 entrants a year.

There is no set syllabus for IRU courses, which are arranged to meet individual needs and usually last seven or eight weeks; the maximum is twenty-six weeks. They are planned and controlled by a case conference team made up of a rehabilitation officer in charge of the IRU, an occupational psychologist, a medical officer, a social worker, a technical officer in charge of the workshops and a disablement resettlement officer (DRO) responsible for liaison with the disablement resettlement officers in employment exchanges. The medical officer is assisted by a nurse and at many Units by a remedial gymnast; consultant psychiatric advice is available.

Rehabilitation is carried out in conditions similar to those which the men and women are likely to meet when they start work again, the workshops simulating a factory environment. They are mostly engaged on production work sub-contracted from government departments and local firms and cover a variety of activities such as machine operating, bench engineering, woodwork, light factory process work, clerical and commercial work, and work of a primarily physical nature, such as gardening and concreting. Activities are planned with the dual object of restoring or improving a person's physical and mental condition and giving him an opportunity to show his occupational potentials. Men and women of any employable age are accepted and there is no segregation by age, sex or category of disability. The general aim is to restore or improve total working capacity and to assess suitability for various types of employment, including suitability for vocational training or re-training in a skilled trade. This training, if recommended, is not provided in the Units but would normally be arranged to follow at a Government Training Centre or other training establishment. At the end of a course the IRU sends a report, which has been discussed with the individual concerned, to the employment exchange in the home area for a placing to be arranged in accordance with the IRU recommendation. Placing is sometimes also effected direct from the Unit.

In addition to normal rehabilitation courses many IRUs also provide work preparation courses for school leavers who because of severe mental or physical handicap are considered likely to find difficulty in settling into employment. These courses, which last for one school term, but can be extended for a second term, when necessary in individual cases, include industrially-biased part-time further education with the balance of time spent in the Unit workshops learning to adapt to industrial life.

There is also provision for young persons on careers officers' registers to be sent for a very short period of assessment (maximum ten days) when more comprehensive vocational guidance than can be given by the careers officers is needed.

The occupational psychologist has a key role to play in an IRU.

The vast majority of people coming to the Units are unable or unwilling to return to their previous job, and require a change of occupation. Research has shown that most of them lack the knowledge or judgement to choose suitable alternative employment for themselves and are, therefore, very dependent on the vocational guidance and counselling provided by the psychologist. Here the IRU psychologist is particularly fortunate in having in the workshops a realistic environment in which to test out over a period of several weeks his vocational hypotheses before arriving at a final recommendation.

Although his primary concern is vocational guidance, for many of the more difficult cases his work will include an important element of therapy. About a quarter of the entrants to IRUs have major psychiatric problems. Many more have psychological problems superimposed upon or independent of a physical disability, such as anxiety, loss of confidence, depression, inadequacy or maladjustment to the disability. These problems the psychologist has to tackle through personal counselling and by manipulation of the therapeutic resources of the Unit. Some two-thirds of the psychologist's time is spent in interviewing. His first meeting with a new entrant will normally take place towards the end of the first week by which time he will have available to him the results of the psychological test battery, a report on early workshop performance, and reports from the medical officer, social worker and DRO. At this interview he completes his initial assessment, initiates any necessary therapeutic action and agrees upon provisional vocational goals. He then allocates the man to an appropriate section of the workshops and briefs the workshop supervisor on the man's assessment and rehabilitation needs. A few days later he reports his findings to the case conference team and discusses his plans with them. During the following weeks he keeps in touch with the man's progress in the workshops and receives regular reports from the supervisors. Towards the end of the course he interviews the rehabilitee again, and by this time they are both normally in a position to be able to agree upon a realistic choice of employment or training. He then drafts a comprehensive placing report which is discussed and vetted by the case conference team before being sent to the local employment exchange.

Industrial rehabilitation provides a rewarding field for psychologists who are interested not only in the assessment of individuals but also in semi-therapeutic work in a social environment where problems of personality, motivation and development of skill interact prominently.

OCCUPATIONAL GUIDANCE SERVICE

Vocational guidance has long been available in Industrial Rehabilitation Units to adults who because of some physical or mental disability were obliged to change their occupation; but it was not until 1966 that a guidance service was offered to the many able bodied adults who were known to be freely changing their jobs. It seemed that some of these would welcome the opportunity of discussing their problems before deciding on a new occupation.

Originally eleven units were set up to test the demand and the response to guidance among these adults.

The term occupational, rather than vocational, guidance was preferred and the units were, therefore, called Occupational Guidance Units (OGUs). They were manned by executive and higher executive civil servants. Psychologists with experience of the Youth Employment and Industrial Rehabilitation Services trained these officers and advised on the procedures and organization of the units. Within a year it was clear that there was a genuine demand from adults for guidance, and follow-up questionnaires suggested that the majority of early clients found it valuable.

OGUs are attached to Employment Exchanges in the larger towns and consist of two or more guidance officers who each conduct by appointment three guidance interviews per day for four days a week, the fifth day being spent exclusively on job studies. Beginning with thirty officers, the number has increased to 144 working in forty-three centres. Occupational guidance is free to anyone over the age of eighteen years. By December 1970, more than 100,000 clients had been seen of whom a quarter were women; and the monthly turnover is now nearing 4,000. Sixty-two per cent of clients are between the ages of eighteen and twenty-four, and about eleven per cent are aged forty or over.

The guidance officers are men and women with several years' experience in the Department's placing service, and a number have worked as youth employment officers, careers officers and disablement resettlement officers. They undergo a seven-week basic training course at the Department's Staff Training Centre, and after four months' practical work in a unit, return to the Centre for a further course of two weeks.

Psychologists are responsible for the professional content of the training and the standard of expertise of the guidance officers. They are now assisted by staff tutors, themselves experienced guidance officers. Training concentrates on developing sound interviewing skills, on the assessment of abilities, disposition, and inclinations along the lines of the Seven Point Plan (Rodger 1952), and on acquiring occupational information by means of job studies.

A form of continuous supervision and training is maintained by the Department's regional senior psychologists who visit OGUs in their area and advise on difficult cases referred to them for a second opinion. This consultancy work is a vital aspect of the guidance service, and as OGUs have expanded the regional psychologists have sought the assistance of outside consultants, who are experienced occupational psychologists working on a sessional basis and visiting units about one half-day per week.

The units confine themselves to guidance and do not undertake to place clients; but standard interview reports are prepared for use by the placement officer if the client wishes to use the Department's placing service. A comprehensive biographical questionnaire is filled in by the client before coming to the unit. If he is under twenty-five he will be asked to complete the Kuder Preference Record which all guidance officers are taught to interpret. The interview will last from an hour to an hour and a half.

Guidance officers do not at present use ability and aptitude tests, but it is intended eventually to train them to do so, in particular for use with the younger clients.

A random sample of a thousand clients taken in 1968 showed them typically to be thoughtful people with good academic qualifications, who were seriously seeking advice before making decisions about their future careers. About sixteen per cent had no previous employment record and forty-eight per cent were employed; the remainder were unemployed and included about four per cent returning to the employment field after several years' absence. In terms of educational attainment, more than seven per cent had a university degree, thirty per cent had 'A' levels, a diploma, or similar professional qualifications, and twenty-six per cent had 'O' levels.

When followed up six months after the guidance interview, seventy per cent responded to a postal questionnaire. Of these respondents fourteen per cent were unemployed and ten per cent were following a course of studies or training. Among those with previous job experience and employed when replying to the follow-up, nineteen per cent were still in the same employment, thirty-two per cent had changed to a job in the same major occupational classification as their former employment, and forty-nine per cent had moved to an entirely different occupational category. In replying to a question on satisfaction with their present job, seventy-two per cent stated they were either well satisfied or fairly well satisfied.

Psychologists at the Training Centre also carry out surveys and research projects themselves, and monitor other projects for which outside research workers have been commissioned. The National Institute of Industrial Psychology has recently completed a statistical analysis of data on the Kuder Preference Record (NIIP 1970). A graduate research worker from Surrey University supervised by Russell Wicks is examining the special problems of clients referred to our consultants and regional senior psychologists by guidance officers. One of the Department's own research officers is about to undertake a two-year project under Professor Sylvia Shimmin at Lancaster University to study the guidance problems of students, who are coming to OGUs in increasing numbers. Another graduate researcher from the University of Wales Institute of Science and Technology, under the direction of Professor Hywel Murrell, is investigating the difficulties of the unemployed older executive.

New training techniques are being introduced to meet the developing needs of the service. Problems of the criteria of effectiveness also weigh heavily, and a more comprehensive follow-up questionnaire is being considered. With the gradual introduction of other testing procedures to add to their existing commitments, there will be a continuing demand from the Occupational Guidance Service for the professional skills of occupational psychologists.

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PSYCHOLOGISTS IN THE PRISON SERVICE

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THE CIVIL SERVICE is in the throes of modernization and reorganization following the acceptance of the recommendations of the Fulton Committee which was appointed in 1966 "to examine the structure, recruitment and management, including training, of the Home Civil Service, and to make recommendations," and which reported in June 1968. The Prison Service received a separate stimulus to increase its organizational efficiency in the Report of the Inquiry into Prison Escapes and Security by Earl Mountbatten (1966). The first stages of the reorganization of the Prison Department are described in the Annual Report for 1969 (Home Office, 1970a). The process, which is continuing down the organization, is now reaching institutional level. The Prison Service is beginning to take shape as a system capable of handling the considerable problems with which it is faced and as part of this process the deployment of psychologists has been undergoing marked change. Attention has been focused on the need to ensure that the best use is made of psychological resources in furthering the aims of the Prison Department. This paper represents the present position from the viewpoint of a psychologist with a qualification in occupational psychology working at institutional level. A comprehensive description of the work of prison psychologists appeared in this journal in 1963 (Straker *et al.*).

The Primary Purpose of the Prison System

The Gladstone Committee, reporting in 1895, recommended that imprisonment should have as its primary and concurrent objects deterrence and reformation. The content of its more specific recommendations showed that it considered that the deterrent element should reside in the fact of imprisonment, whilst the conditions under which imprisonment was served should be primarily directed towards the reformation of the offender. This description gained general acceptance, and has been responsible ever since for attracting men of high principle and vocation to the Prison Service. Of late, in face of lack of evidence for much success in reducing recidivism, it has been suggested that one ought to consider abandoning attempts to find institutional

*The views expressed in this paper do not necessarily represent those of the Prison Department, Home Office. The author is Senior Psychologist at HM Remand Centre, Risley, having previously been assistant principal of the Prison Officers Training School, as well as an assistant governor.

solutions to the problem—see, for instance, Professor Nils Christie as quoted by A. Bainton (1970). However, one must identify with Bainton's conclusion that it is against common sense to accept that prison treatment has no effect at all, good or bad, on most offenders, and one must operate on the hypothesis that research has so far failed to use the most suitable methods to achieve positive results. Whether one is concerned with diagnostic or therapeutic work with individual offenders, carrying out evaluative studies on systems or helping in the planning of new establishments or new systems of training, the reformation of the offender must remain the central purpose of our work: to describe how prison psychologists' skills are applied to this task is the primary purpose of this paper.

Present Pressures on the Prison Service

The Prison Service is at present under considerable pressure from a variety of causes. Over the last thirty years the prison population has risen from under 10,000 (in 1940) to over 39,500 (January 1971). Borstal numbers have mounted steadily from under 2,000 in 1938, to over 3,000 in 1948, to approaching 4,000 in 1958, to over 5,500 by 1968; and on 31 January 1971 the figure stood at 6,200. These figures refer to the numbers in custody at any one time. In terms of turnover, opposite factors operate for prison and borstal respectively. The official publication *People in Prison* (Home Office 1969), showed that the increase in prison numbers was partly caused by longer sentences. In the case of borstal, however, the increase in population figures has occurred despite a very significant decrease in the average time served. Noteworthy success appears to have been achieved recently with the judicious release of prisoners under the new parole system.* For penal treatment itself, however, there have been few encouraging results. For example the last figures issued suggest that an increasing number of borstal trainees have been reconvicted soon after discharge. This must be a source of concern because, once the initial difficulties of resettlement have been overcome, any beneficial effects of training on personality would be expected to be maximal at this time. Concurrent with the pressures of increasing numbers have been pressures resulting from the Mountbatten Report to improve security and reduce the number of escapes. The present picture is therefore one of considerable overcrowding and very taxing working conditions for staff.

Personnel Resources

The Prison Service at present employs a total of some 15,000 staff, including over 10,000 discipline officers (of whom a few hundred are temporary officers). In May 1971 there were sixty-six psychologists' posts authorized. Seven psychologists are employed at Head Office in London or in one of the

*The Criminal Justice Act, 1967, made provision for the release of prisoners serving determinate sentences after only one-third of their sentence (with a minimum of one year served). This involved the setting up of a central Parole Board and local Review Committees attached to each prison and for a radical revision of the system of assessing and reporting on prisoners by prison staff. Prison psychologists have been deeply involved in devising the assessment forms used and in training prison officers employed in the Classification Units which were set up to fill this and other needs.

four Regional Offices; fifty-nine work in prison establishments. Allowing for time which has to be given over to training during the early period of service, staff changes, etc., one might fairly say that approximately fifty full-time psychologists are potentially able to see prisoners. The total receptions during 1969 as shown in the Statistical Tables were 123,244 male prisoners and 5,235 female prisoners (Home Office 1970b) so that the ratio of psychologists to receptions per year is 1:2,569. The ratio of discipline officers to receptions is 1:13. Clearly, psychologists can make only a limited impact on the prison system by personal interaction with prisoners and their appropriate contribution is in terms of maximizing the use of the much larger personnel resources which the service commands. This can be achieved by assisting in staff selection, by tackling problems of work motivation and job satisfaction for staff, by feeding back into the system information enabling the relative merits of different training methods to be assessed, by helping to develop suitable methods of classification and allocation, by assisting in training discipline staff in special techniques and by performing a support function in relation to staff at all levels. These might all be regarded as servicing functions analogous to those performed by psychologists in many industrial organizations.

There is another important area which at present occupies a central part in the job roles of a considerable number of psychologists. In the face of overcrowding and continually mounting numbers, a large prison building programme has been taking place and will continue for several years at least. Prison building involves producing a structure in bricks and concrete and past experience tells us that once built it may have to last for well over a century. It is the experience of all prison governors that the range of possible regimes is greatly affected by the nature of the buildings within which they have to operate. To offer useful advice on the planning of new establishments which will satisfy the need for security as well as create social organizations of maximum therapeutic value, the prison psychologist ought to be involved from the earliest planning stages. This has happened in several instances, with the psychologist starting out as a member of the project team and continuing as a member of staff or visiting consultant once the new establishment is open. This is a logical extension of the change from a diagnostic role with the individual prisoner to a broader role where the subject of study is the prison community as a social organization (Fitch 1968).

There remains one area in which psychologists may appropriately be employed in relation to individual prisoners, namely advising on difficult cases. (It is, of course, necessary for psychologists to interview a large number of prisoners in the early years of their service so as to gain insight into the problems presented by typical cases before they are able to recognize especially difficult ones.) The arithmetic of staffing ratios implies that the key figure in the reformation of the inmate must be the basic grade discipline officer. The function of the psychologist in all the activities listed must be to enrich the prison officer's role and to help overcome pressures which might tend to push him back into the purely custodial role that he used to fill in the early years of this century before he ceased to be described as a 'warder'.

In the role of specialist adviser to management it is interesting to compare the prison psychologist's role with that of his opposite number in industry. There, also, psychologists are concerned with maximizing personnel resources and with organizational structure. In industry, however, despite a tendency in recent years to refer to matters like staff morale as outputs, the influence of the entire socio-technical system on the individuals concerned is secondary to the outputs of goods or services for which the industry exists. In the prison system, on the other hand, whilst not decrying the training value of work, the primary output is measured in terms of the influences on the personality and behaviour of individuals and all else should be subordinated to this. The psychologist's function is, therefore, a central rather than a peripheral one in the prison organization, and it is his responsibility to use his influence to ensure that this primary goal is tenaciously pursued. Specialist advisers have a professional responsibility constantly to ask themselves what the nature of their specialism is and what the quality of their advice. It is clear that the areas in which advice is needed are wide and often answers can be given to pressing problems only by original research. It is not surprising that much time has, therefore, to be given both to study and professional training for psychologists and to research into the urgent needs of the Prison Service.

Organizational Structure of Prison Psychologists

Psychologists are stationed at three levels in the service where they are responsible for advising on psychological matters.

Chief Psychologist. The Chief Psychologist is stationed at Prison Department Headquarters in London. His staff normally consists of one Principal Psychologist, one Executive Officer and a Personal Assistant. He has overall responsibility for all psychological services, including advising on the recruitment, training and career development of psychologists.

Regional Psychologists. The Regional Psychologists are stationed at the four regional offices. They are responsible for psychological services within the region. As senior and experienced professional advisers they are able to assist the Regional Director and his staff in tackling a wide variety of problems. They are also the first point of reference for Governors of Prison Department establishments in the region about psychological aspects of current problems and are responsible for the deployment of the resources represented by the members of psychology departments within the various establishments.

Psychology Departments in Prison Establishments. These are twenty in number and of size varying from one to eight psychologists. Typically the head of each department is a Senior or Principal Psychologist. A number of departments employ psychological testers and other supporting staff. There is a great deal of variety in the kinds of work performed in different establishments due to the differences in function and consequent needs. Thus, for example, the work of the psychology department in a local prison or remand centre may be of a largely clinical or diagnostic kind designed to assist assistant governors and medical officers in compiling reports to court;

in a training prison it is largely of a management advisory kind, at an allocation centre mainly research in character and in a psychiatric prison related to monitoring or participation in therapy.

Staff Training and Support

These form a part of the duties of many psychology departments. In many prison establishments courses have been run by psychologists for staff involved in group counselling. Psychologists have also participated in the training of all prison officers employed in Classification Units in interviewing and classification methods, in running courses of background training designed to assist in the understanding of human behaviour, in the preparation of officers for promotion examinations and in the training of staff employed in the selection of prison officers. A typical way in which a prison psychologist might function in relation to group counselling is as follows: he would be designated as adviser on group work at, say, a training borstal; he would in this capacity liaise with the Governor in planning initial training courses for staff and would probably play a major part in running these courses; subsequently he would attend meetings of staff concerned to give further advice and training, provide guidance on specific problems and generally support the staff involved.

Work With Individual Prisoners

Among the cases with which psychologists are asked to assist are those in which mental illness or subnormality is suspected. In other cases the request is for guidance about the personality of the offender, help in understanding aberrant behaviour or advice on the management or remedial training of individual offenders. This work is, in some cases, analogous to the work of clinical psychologists, or to that of educational psychologists, employing similar diagnostic techniques. However, the cases seen are rarely of a classical clinical kind as these are usually recognized and admitted to a mental hospital, possibly without even being brought to court. Many of those seen would be categorized psychiatrically as 'behavioural disorders'. There are often special problems in interpreting test results which have been adversely affected by poor motivation, manipulative intent, or some other factor which would not be so important outside the special situation of prison work. Typically, the psychologist would interview and test the prisoner, consult background information available in the prisoner's record, and discuss the case with other prison staff, and perhaps a probation officer; he would then make a written report providing guidance to prison staff preparing reports to court, or making decisions about classification, allocation, training or discharge. In some cases (a small minority) the psychologist might have a continuing therapeutic responsibility towards a particular prisoner.

Research

It is incumbent on social scientists to ensure that their advice is soundly based (Klein 1969). Like any social scientist working in an applied field, prison psychologists are constantly faced with requests for advice which they realize

can only be answered after appropriate research; they have in fact carried out research into many areas of concern to management. Apart from articles published in technical journals, many research papers written by Prison Service psychologists have circulated privately within the Service during the last fourteen years. Research has covered a wide field including normative studies of test data, background information, criminal records, etc., of samples of groups of prisoners (Taylor 1960, Fitch 1962, Johnson 1964, Fitch *et al.* 1962), investigations of the effectiveness of training methods (Shapland 1961, Cockett 1967), investigations aimed at elucidating some aspect of criminal behaviour such as recidivism (Blackler 1968), alcoholism (Brand 1966), and so on. A number of studies have had prison staff as their subjects and have investigated such matters as officers' training (Maxted 1967) and staff attitudes (Marcus 1970). Some investigations have been primarily into the operation of institutional processes (Branton 1967). Most of the investigations listed have been carried out by psychologists in the course of duties not primarily concerned with research and the opportunity for experimental manipulation of variables with appropriate control groups has rarely occurred. A noteworthy exception is the so-called pooled allocation research (Williams 1970) in which boys were allocated at random to three borstals with very different training regimes. Some research has been concerned with developing psychometric tests (Brand 1968, Cockett 1968).

Conclusion

The prison psychologist's role has many facets involving skills shared with practitioners in other fields. Elements of the work of clinical or of educational psychologists may be represented among the requirements of the job, but the most appropriate orientation is that of the occupational psychologist. In this role the main function is to assist management by bringing to bear special knowledge, skills and insight on problems which impede the achievement of goals, and, characteristically, this involves helping to maximize personnel resources. Thus the prison psychologist is seen as an integral part of the Service. He will need to carry out research in order to play his part, but the purposes of the research are those which he shares with the Service as a whole.

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THE DEVELOPING ROLE OF THE SERVICE PSYCHOLOGIST

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THIS ARTICLE REVIEWS the role of psychologists employed by the Ministry of Defence departments. It is concerned with research content rather than organization, with trends rather than specific projects. There is not space to do justice to the valuable supporting work carried out by extra-mural units, and the statement must in any case be regarded as a personal one prepared at rather short notice.

It is probably known that the Navy, Army and Air Force set up groups of psychologists in the first half of the Second World War and that each group can show continuity from then up to today. Sometime about the end of the war it was decided that the employment of service psychologists should be perpetuated after hostilities; there were however arguments, stretching over several years, about their correct categorization within the civil service context. Admission to the Scientific Officer class was sought and refused, and in the end (autumn 1950) a separate Psychologist Class was set up. The great majority of the founder members were employed by the services, but during the next few years two other major employers (Prison Commission and Ministry of Labour) entered the field. At the moment the total of Civil Service psychologists is in the region of 175, the Ministry of Defence accounting for about a third of them. An outline of their developing interests will be presented first in chronological blocks and then in terms of work content.

1941-1947

During the war years the preponderance of psychological effort was devoted to the building up of large operational forces through scientific selection. Within this field events dictated an unofficial division of effort. The Naval group, recruited from the NIIP under Alec Rodger's leadership, centred its attention on a sensitive trade allocation system; the Army, virtually without an officer corps after Dunkirk, devised the well-known WOSB technique; the RAF, in a cross fire between Bomber Command losses and the transfer of flying training to overseas theatres, concentrated on the aircrew problem.

War-time conditions, with their vast and continuing training intakes, made for considerable advances in the identification and measurement of abilities and afforded opportunities for many validation studies. They also

supplied a great deal of evidence emphasizing the unreliability of the unstructured interview and the need for more thorough personality appraisals. A detailed statement of the work of this period may be found in 'Personnel Selection in the British Forces' (Vernon and Parry, 1949).

The years immediately after the war saw the abandonment, as a result of rapid demobilization, of many research studies and were for all concerned a time of rundown and uncertainty.

1948-1951

This period stands out retrospectively as one of storm and stress. World events included the Berlin airlift, Russia's first atomic bomb, the establishment of Mao Tse Tung's regime and the outbreak of the Korean War. There was also creative turbulence in the world of technology. 1948 saw the publication of Shannon's papers on information theory and Wiener's *Cybernetics*. Psychologists were quick to discern in these a point of departure for experimental work in human control and communication, sometimes to the alarm of the mathematicians and engineers more directly concerned. Blueprints for the first electronic simulators, the first computers and the first teaching machines appeared about the same time while the swift developments in weapon and communication systems led to a changed requirement in maintenance needs, the traditional workshop skills becoming largely superseded by ability in diagnostics.

These events opened the door to two new areas in the programmes of military psychologists, training research and human engineering. Training research was of course not a new concept, but the manpower needs of war-time had left little effort available for this kind of study. The greater leisure of the post-war years coupled with the pressures of new training objectives quickly altered the emphasis of research.

The word 'ergonomic' appears to have been coined in the spring of 1950. A few months earlier a Human Research Group, later to become known as the Ergonomic Research Society, had been formed. Its first president was a psychologist then in the employment of the Admiralty whose programmes over the past twenty years have shown consistent interest in both new fields. In the RAF the two lines have been pursued by different groups; training studies have for the most part been carried out by research groups attached to Flying Training and Technical Training Commands (recently brought together), while human engineering has supplied the focus of interest for a separate group centred at the Institute of Aviation Medicine.

In the summer of 1950 a conference of commonwealth scientists met at Cambridge under the chairmanship of Sir Henry Tizard. The purpose of this conference was to review the main areas of defence research, and in the course of it a powerful presentation of the achievements of personnel selection was made by Simon Biesheuvel, the South African representative. This presentation did as much as any single event to bring psychology within the purview of defence science, and led to an arrangement whereby the three-yearly reviews of Commonwealth Defence Science were preceded by meetings of psychologists. The task of organizing these meetings became the chief activity

over the next ten years of the Panel of Service Senior Psychologists set up in the Ministry of Defence about the same time.

1952-1961

This decade opened with the last phases of the Korean War and ended with the wind-up of National Service. In between came Suez, Macmillan as Premier and the 1957 White Paper. The last of these, by casting doubt on the future roles of the services, gave rise to much uncertainty in manpower planning.

In the middle 'fifties a fourth area of research seeded itself, largely as the result of a project conceived by the RAF. The essence of this project was to place a large unit on an experimental basis with a view to studying the effects on morale of introducing three sets of innovations. Evaluation of these effects called for the services of a social scientist and the questionnaire method adopted set a precedent in 'Ground to Air' communication which has been extensively followed. Sampling the opinions and attitudes of junior personnel serves a triple purpose; it assists manpower directorates to anticipate future manning strengths, it assists personnel directorates to modify service conditions in ways that enhance morale, and it helps those responsible for training in management to adopt an alert and well-informed attitude to contemporary service life.

Meetings of Commonwealth Defence psychologists took place in Delhi (1953), Toronto (1956) and Melbourne (1958). The main participants were Canada, India, Australia, South Africa and the United Kingdom. A fourth meeting in London (1961) contained a predominance of UK psychologists with observers from Australia and India. Preparations for these meetings called for detailed statements from each country showing the numbers employed on defence psychology and the main problems studied. The general picture was of a gradual transfer of effort from personnel selection to training, human engineering and social research. The programmes included joint sessions in which non-psychologist military representatives participated and technical meetings conducted on seminar lines. The Panel's initial choice of authors and themes always attempted to reflect the balance of effort in the main areas of work. 1961 saw the reorganization of Commonwealth Defence Science and the disappearance of triennial gatherings.

In 1956/57 two international groups with a bearing on military psychology were set up. A NATO Advisory Group on Defence Psychology was established on American initiative with the object of collecting information about the work in different NATO countries and stimulating its growth by sponsoring conferences and study courses. General symposia in Brussels (1957) and Paris (1960) have been followed by yearly programmes covering a considerable range of themes. The Western European Association of Aviation Psychology was founded by Dutch psychologists in 1956 and has held two-yearly meetings ever since. Its membership includes civil as well as military aviation psychologists, and full membership is restricted to those working for aviation institutes.

1962-1971

During the past ten years the Services have been engaged in building up small and as far as possible select regular forces. The ending of conscription naturally highlighted recruitment problems, the significance of the service image as perceived by the public, and the importance of understanding the interaction between changing social conditions and service values.

In April 1964 the three service ministries were formally unified under a central Ministry of Defence. Among a number of committees formed as a result was a high-level Working Party instructed to "review the work on personnel and anti-personnel research". Its deliberations lasted nearly two-and-a-half years and it was unfortunate that its report was submitted at a time of maximum financial stringency which led to the shelving of the most important recommendation affecting psychologists. This called for the setting up of a Human Factors Research Establishment that would serve the needs of all three services without disrupting their existing programmes. The need for such a unit is strongly felt by the majority of service psychologists who continue to hope that it will eventually be possible to carry this recommendation into effect.

As a result of the above report the Defence Research Committee called for a further study of personnel research, this time by the chief scientists of the three departments. Their findings, published in 1970, recommended the strengthening of the Service Psychologists Panel and the formation of a Social Research Advisory Panel to co-ordinate the different lines of activity in this field. This latter panel, which is administered by the Ministry's central staff, began work in the autumn of 1970. The membership includes the Ministry's Chief Statistician, the three senior psychologists and interested service directors.

The trends of research over the past ten years may be indicated by the recommendations of themes for future study made at the end of the 1961 Conference. These covered the relative importance of abilities and motivational factors in personnel selection, the effects of stress on skilled performance, the structure of the interview, problems of social psychology within the services, inter-group comparability (i.e. of the main cognitive tests used by Navy, Army and Air Force), and the acceleration of skill acquisition. The Psychologists Panel set up working parties to pursue the last two of these, a research project was carried out by the RAF in respect of the first, and statements on all six were put out in 1966.

In the absence of Commonwealth meetings, the Panel have sponsored periodic one-day and two-day meetings for service psychologists in this country. The last two of these have been held at the Royal Military College, Shrivenham, and have provided valuable opportunities for discussion.

Another international group, this time concerning service psychologists of the United States, Canada, Australia and UK, has recently come into existence. Three panels responsible for exploring specific areas have been established.

DEVELOPMENTS WITHIN THE MAIN RESEARCH AREAS

Personnel Selection

Most selection studies have started by isolating the cognitive from the non-cognitive aspects of occupational requirements and providing objective measures of the first. (Officer selection is the big exception.) This has frequently made an important initial contribution and such procedures are commonly accepted in all three services. Three major questions are left unanswered:

1. What further contributions can be looked for from the measurement of personality factors?
2. How are the results of different types of predictor to be combined?
3. Are there adequate criteria for the validation of selection procedures?

Personality measures have been put forward in many guises, questionnaire, projective, sociometric, psychodramatic, test performance. Only the first has given promise of enhancing the predictive power of selection, but it is still unclear how much it is reasonable to expect from this source.

Combination of predictors. There is no special difficulty in combining predictors that relate to the same criterion; the complication is greater if predictors bear on different ones (e.g. if aptitude tests relate to a group of skills, and questionnaire or interview have a special bearing on those likely to withdraw from training). There is the further problem of ensuring that additional predictive information (conceivably biographical or educational items) is not neglected. The business of assembling all relevant information, whether extracted from standard selection instruments or not, and using it to the best effect is the sort of issue that lies behind much of Cronbach and Gleser's well-known book on selection and decision-taking.

Criterion weaknesses. Criteria that depend on broad human valuations are often far less meaningful statistically than the selection instruments they are used to validate. The effect of an impure criterion is to debase the apparent value of selection, and for this reason it is important to study the information used as a basis for criterion measurement and to ensure that it has a bearing on the critical features of training behaviour.

Training

Training research studies cover the assessment of training proficiency (closely related to the criterion problem just mentioned), the optimum use of instructional methods, the possibilities of new instructional techniques and the relating of training objectives to operational needs. Assessment problems range from the use of new-type items in end-of-course examinations to the reliability of instructor ratings in complex practical situations. Much of the early work on service training was in this area.

Service psychologists carried out their first experiments in programmed learning nearly ten years ago and in 1966 the Stationery Office published a report on this work ("Programmed Instruction in the British Armed Forces"). The importance of precise task analysis as a means of linking training and field requirements is today generally recognized as is the need to develop

training methods which will make it possible to make men of somewhat lower ability effective in some of the skilled trades.

Trades presenting special training problems include sonar operators, to whom the Navy psychologists have given much attention, and guided weapon operators, of special concern to the Army. The introduction of flow diagrams in RAF technical training manuals has been largely the result of Research Branch study. The Training Research Working Party has carried out a recent review of training for electronic maintenance, and extra-mural studies on the application of adaptive training methods have been commissioned. Themes likely to loom large in the next few years include experimental studies on the use of training simulators and the development of training modules intended to make for more flexible training strategies.

Social Research

Attitudes to training and the use made of it, on-the-job satisfaction and general service conditions are among the more prominent themes bearing on a serviceman's intentions to renew his service or to go into the civilian world. These are within the scope of social psychologists or sociologists employed inside the Ministry of Defence. It is accepted that this type of information needs to be complemented by studies of the public's attitudes to the Services and that such studies are best made by outside agencies in collaboration with those working on internal problems.

Most of the projects so far carried out have been undertaken on behalf of a single service. But there is machinery for two-service and three-service studies, and a few of these have been successfully handled, notably a tri-service enquiry into the attitudes of young entrants towards length of engagement.

Although most of these studies are concerned with social attitudes, the questionnaire technique can be applied in other military contexts such as determining the most effective of several methods designed to instil the principles of flight safety, or discovering the relative popularity of features in a service newspaper.

The limitations of the attitude questionnaire are recognized and there is a need for systematic study of some of its features. Items range from the strictly factual to the highly conjectural and it is important to know what degree of reliance can be placed on answers to each kind. Other less direct techniques—e.g. the repertory grid—also need to be tried.

Human Engineering

This area covers human factor problems ranging from those implicit in the design of a single item of equipment to that of the most elaborate weapons and communication systems. The legibility of a dial, the lay-out of an instrument panel, the environment in which a crew have to work, the division of work between different crew members, the allocation of tasks to men or machines, all of these fall within the limits of this field of study.

Since military systems are designed for use in emergencies, nearly all these human factor problems call for comparisons between behaviour in

normal and extreme conditions. It is not enough to resolve a proposed task into familiar components like presentation of information, tracking and decision making; it is also necessary to consider how the total activity will be affected by deviations from the norms of heat, noise, vision, vibration, length of mission, loss of sleep and other deprivations. Many of the more basic themes are handled extramurally, largely by the Applied Psychology Research Unit, Cambridge, while problems deriving from specific projects are assigned to in-service groups such as the Institute of Aviation Medicine and the Navy's Applied Psychology Unit. The Army Personnel Research Establishment allots a high proportion of its resources to ergonomic studies; the soldier is called on to operate in a very wide range of environmental conditions, hence studies of his performance in possible combat situations occupy a specially prominent position in Army programmes.

It need hardly be said that the association between engineers and human factor scientists is all important in these design studies; the importance of seeking relevant psychological information at the right moment in a system's development is becoming more widely understood.

Protective isolation is a natural condition for any new research area or discipline, but it should be discarded once the plant has taken firm root. There have been signs recently of increasing interaction between the four groups of specialists whose work has been discussed, and this widening of interests is wholly to be commended. There are also suggestions of burgeoning intimacy between military psychologists and the other disciplines that bear on personnel issues, engineering, statistics, operational research, physiology, sociology. Progress in the coming years may well depend as much on fostering an understanding of the psychologist's research methods and objectives as on opening up any further field of study.

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THE MEDICAL RESEARCH COUNCIL INDUSTRIAL PSYCHOLOGY RESEARCH GROUP An Outline of its History and Work to 1958

R. MARRIOTT

ORIGINS AND HISTORY

IN THE MEDICAL RESEARCH COUNCIL'S 1955-56 annual report (3, p. 118) the date of origin of the Industrial Psychology Research Group was given as 1918. Actually, this was the year in which its parent body, the Industrial Fatigue Research Board, was set up jointly by two Government research bodies—the Medical Research Council and the Department of Scientific and Industrial Research. The Board was a successor to the Health of Munition Workers Committee, which was appointed by the Government during the 1914-18 war to study industrial working conditions. Referring in 1944 to the work and purpose of this Committee, Schilling (4, p. 145) quoted its terms of reference as follows: "To consider and advise on questions of industrial fatigue, hours of labour, and other matters affecting the personal health and physical efficiency of workers in munitions factories and workshops." This was perhaps the first governmental interest in research of this kind in the industrial field.

In 1920, owing to the country's economic difficulties, there were doubts about the continuation of the Board but these were resolved when the Medical Research Council accepted full responsibility for its administration and scientific work. Later (in 1928) the title was changed to Industrial Health Research Board as it seemed better to indicate its wider function of promoting health in industry rather than merely stressing one aspect of its work—the study of fatigue. The directing committee of the Board was composed of representatives of industrial management, trade unions, and medical and academic bodies. Experimental studies and surveys were carried out by individual research workers and small teams, and both physiological and psychological problems were investigated. The way in which the work had developed can be seen in the terms of reference given when the Board was reconstituted during the 1939-45 war—in 1942: "To advise and assist the the Medical Research Council in promoting scientific investigations into problems of health among workers, including occupational and environmental factors in the causation of ill-health and disease, and the relation of methods and conditions of work to the functions and efficiency of body and

Reprinted from *Occupational Psychology*, 1958, 32, 26-33. At the time of writing, the author was Assistant Director of the Group.

mind; and in making known such results of these researches as are capable of useful application to practical needs."

Between 1918 and 1947 over 100 reports and many papers were published (cf. 2, pp. 23-28, for list of reports). Broadly speaking, the wide range of subjects covered can be classified under the general headings of environmental conditions (lighting, vision, heating and ventilation), the effect of industrial solvents, industrial disease, sickness and absence, hours of work, repetitive work, human relations, vocational psychology, time and motion study, accidents, skill and machine design.

After the 1939-45 war it was decided to bring the existing teams working for the Board into line with other units or groups of the Medical Research Council by making them self-contained and directly responsible to the Council for their activities. Two of these teams had of late years been mainly responsible for most of the psychological investigations. One, the Applied Psychology Unit at Cambridge, had done much work on accidents, environmental conditions, skill and machine design. The other team, under the direction of Dr S. Wyatt, had been mostly concerned with such industrial psychological problems as absence from work, motivation and incentives, interest and boredom in work, and satisfaction and discontent in the working situation. This team, therefore, became the Industrial Psychology Research Group (referred to below as 'the Group') with Dr Wyatt as its first director. In 1952 the Group was transferred to University College, London, under the honorary direction of Professor R. W. Russell and Mr J. W. Whitfield of the Department of Psychology.

IMMEDIATE POST-WAR RESEARCH

From 1946 to 1952 the Group's two teams, varying from four to six investigators in each, were mostly occupied with comparative studies of the nature, extent and causes of satisfaction and discontent in various types of large industrial organizations. The chief methods used in these surveys were the interview and the collection and analysis of those factory records which it was thought might show some relation to the attitudes expressed. Among them were records of age, length of service, type of work, system of payment, size of group, family responsibility, absence, labour turnover and earnings. Some of these had to be discarded for various reasons but the published papers show, for instance, clear-cut relationships between working efficiency and size of group (9, 16, 17) and between satisfaction and size of group (21, 43). They also demonstrate that workers' satisfaction was correlated with the amount of mechanization in the layout (21, 32, 43). Satisfaction with earnings was related to family responsibilities, and general satisfaction to various factors such as hours of work, shift systems and management policy (18, 21).

Satisfaction was, of course, compounded of factors other than those which objective records could reveal and the interviewing methods were designed to deal with these. The structure of the interviews and the procedure for conducting them were very carefully planned, and the interviewers

were controlled in an attempt to prevent personal bias affecting the results. A full description of the methods used is given in two papers (19, 21). In all, sixteen papers and articles were published during 1949-55 in connection with these investigations. (Those not referred to in the text are given in References 10, 12, 14, 15, 33 and 42.)

A final report (43) on one of these studies concentrates mainly on the attitudes to the operation and to group payment systems of nearly 1,000 men in two car factories and a group of metal rolling mills.

Other papers concerned with payment systems discussed the psychological conflicts within and between groups produced by group schemes (11), described a case-study of a successful merit-rating scheme (13), and compared the effects on productivity and the workers of the setting of different time study standards for two groups on identical work (41).

OTHER INVESTIGATIONS

After 1953 most of the research done by the Group was concerned with three general problems—absence in heavy industry, communication within industrial firms, and incentive payment systems. Projects under the two latter headings were sponsored by the Joint Committee on Human Relations of the Department of Scientific and Industrial Research and the Medical Research Council, and were partly financed by the USA under what was known as the Conditional Aid Programme (1).

Some papers and abstracts bearing on the investigations have been published (24, 25, 26, 27, 28, 29, 30, 34, 40). The following are brief outlines of the methods used and the main conclusions:

Absence from Work

A survey (27, 28, 29) was made of the absences of 3,000 men in an Engineering and two large Iron and Steel works. Absence from all causes was compared for such factors as age, family responsibilities, length of service, wages, hours of work and physical conditions.

It was found, in general, that absence was least for men with two dependents and higher for those with fewer or more—the curve was U-shaped; higher paid men lost more time due mainly to sickness but partly to absence without permission; absence was associated with heaviness of work, the trend being more pronounced for short absences and among men on continuous work; continuous work also appeared to cause more absence among men over 45 years old; on three shift systems about three-quarters of the single shift absence without permission occurred on the early morning shift, due it was thought to the 6 a.m. start.

Communication in Industry

Three studies were made under this heading, one (a) in the Laboratory and two (b) and (c) in factories.

(a) This experimental study (34, 47) sought to compare the relative understanding and retention of salient points in a prose passage (uncompressed information) and in a precis of it (compressed information). Pilot

studies showed that recall, not recognition, of the material was the most successful method of discriminating between the two kinds of information.

The principal results were that the original passage allows a significantly better recall than does the precis; a greater number of gross errors occur in recalls from precis than from originals; significantly fewer points are recalled from precis than from the originals; the relationship between compression of the material and time required for understanding is not linear (precis, one quarter the length of the original, take about half the amount of time to be understood).

(b) Studies (24, 25, 45) in four engineering firms were made, by interviews, observation and the analysis of records, of the differences in formal communication structures in planning and production control, in particular of their effects on the estimating of delivery dates to customer firms. The aim was to relate these differences to the degree of coincidence between the actual and estimated delivery dates, and to the expressed satisfaction or dissatisfaction of those engaged in the planning and control of production.

Differences between the firms in these respects were mainly in the degree of integration between planning and control. On this depends the adequacy and accuracy of the estimator's knowledge of the results of his decisions. It was found that more accurate estimates were made and greater satisfaction was expressed where there was unity of planning and control. The opposite was true where these two functions were divided.

(c) This was a detailed case-study (44) of the reasons for production delays in an engineering factory. Three communication systems were defined—the routing and progressing of individual orders from reception to delivery, the information systems used in preparing instructions for the orders, and those used for the general control of production. The aim of the study was to relate the detailed histories—times allowed and taken—of 347 works orders with the data obtained in interviews with all members of the staff responsible for technical and administrative decisions. The interviews supplied information about the records and channels used in making decisions.

INCENTIVE PAYMENT SYSTEMS

Research on this subject took the form of (a) four separate studies (30, 31, 40, 46) which, although conceived as parts of the whole, were carried out to a large extent independently of each other, and (b) a review of research and opinion on incentive payment systems (20).

(a) Two of these studies were general field surveys relating to workers' understanding of incentive payment systems and to the aims associated with the introduction of such systems. The other two studies concerned the effects of changes in incentive payment systems in a factory and a repair works. The chief methods of assessing satisfaction and understanding were by interview, self-rating scales and workers' estimates of their bonus earnings. All the studies showed the importance of considering the total factory situation, the relevance of the incentive payment system to the nature and organization of the work, and the social effects produced by these systems.

Satisfaction with a system appeared to be related to the understanding of it, and this depended on the workers' ability to explain it to themselves. Formal or theoretical knowledge of the principles of a payment system was not related to a functional or working knowledge of the cash value of the work done. Thus those who had the greatest formal knowledge were not the most accurate in estimating their bonus earnings. Workers' own assessments of their understanding were unrelated to either formal or functional understanding.

In the two studies of changes in payment systems it was found that improved morale and satisfaction followed the change but it was not possible to attribute this to the alteration alone. There was evidence that improved output may accompany increased satisfaction but different performances by comparable working groups were attributable more to the size and stability of the groups. As noted in earlier studies (11, 43) social conflicts arose in group systems if there was equal reward for unequal effort.

(b) In this review, accounts are given of the views and experiences of industrial executives, consultants, trade unionists and research workers. Although it was originally intended to restrict the review to incentive payment systems, it was found impossible to omit frequent reference to their non-financial aspects.

INCIDENTAL STUDIES

In addition to the investigations referred to above, essential incidental studies have been carried out on methodological problems in order to facilitate work in this field. Among these are:

- (i) A study of the dangers of using the crude absence rates available in industry (8).
- (ii) Examinations of the use of linear and verbal self-assessment scales in the assessment of attitudes (21, 46).
- (iii) Consideration of possible extensions of the paired comparison technique in opinion measurement and in measurement of agreement of opinion (preliminary reference in 46).
- (iv) A study of the different methods of measuring understanding and remembering of verbal material (47).
- (v) Development of rank correlation methods (35, 37).

Papers were also published on accidents in industry (36, 38, 39), and on the effects on skill and performance of machine design (39), environment (22) and technological change (23).

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THE MEDICAL RESEARCH COUNCIL INDUSTRIAL PSYCHOLOGY RESEARCH UNIT 1958-1967

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CHANGES IN STRUCTURE AND LOCATION

THE PURPOSE OF THE PRESENT NOTE is to update Marriott's (1958) paper by covering the final ten years of the group's activities.

From 1958 the status and title of the group were changed to that of Industrial Psychology Research *Unit* in keeping with the distinction between 'Research Group' and 'Research Unit' drawn by the MRC in its Report for 1958-59 (p. 13).

There is a sense in which this decade can be regarded as the Unit's first 'peacetime' period, since the immediate post-war years were taken up by the completion and extension of the wartime attitude studies, while the early fifties were dominated by Conditional Aid research. The Unit's activities during this period lack the immediately obvious unity of approach of the periods immediately preceding, and this reflects, in part at least, the rethinking and reorganization that characterized the whole field of behavioural studies during the early sixties. It is a reflection, too, of the developments that were taking place in the nature of much industrial work and the working environment. This was very much a time of change and experiment within the Unit, and the lines of individual interest and emphasis that were developed are to be seen not only in the list of publications, but in the present varied activities of ex-Unit members who are to be found in departments of mechanical engineering, occupational health, organizational behaviour, and psycho-linguistics, as well as in government service and the clinical field.

This period also saw a number of temporary secondments of Unit members to organizations as diverse as the Center for Cognitive Studies at Harvard and the Labour-Management Relations Division of the ILO in Geneva, as well as various pieces of co-operative research with such bodies as the Road Research Laboratory and the Industrial Training Research Unit.

In 1965 a nucleus of the Unit with more readily-apparent 'industrial' interests was transferred from University College, London to the National Institute of Industrial Psychology, with Dr C. B. Frisby succeeding Professor G. C. Drew as Honorary Director.

The Unit was finally disbanded on Dr Frisby's retirement, two years later, precisely half a century to the month after the original invitation to the

DSIR in December, 1917 to appoint a committee to investigate problems of industrial fatigue.

RESEARCH ACTIVITIES

A number of publications relating to the earlier Conditional Aid projects appeared at the beginning of this period. These concern communication and decision-making in industry (37, 38, 39, 49, 63) and incentive payment systems (6, 34, 35, 44, 48, 49). As a parting salvo before his retirement in 1962 Marriott also completed a study of merit-rating systems in three factories (36), a comparatively neglected aspect of incentives at that time. His report provides an interesting account of the difficulties involved in attempting systematic assessment of total employee performance, and of the dissatisfaction on the shop floor to which the misapplication and manipulation of well-intentioned schemes can lead.

Also within the general field of motivation a number of studies were made of the practice of overtime, which had now become an accepted feature of the working week. Confirming evidence was provided that individual differences in overtime hours were related to family and financial responsibility (15). But another earlier finding—that more overtime was worked by those on lower hourly rates—was only partially confirmed. Nor was most overtime worked as compensation for lost time. A further interesting observation in the light of current discussion of the deterrent effect of taxation was of little relation between taxable income and the amount of overtime worked. It was demonstrated how, in a free-choice situation, individual differences in overtime working are determined not only by financial considerations but by a range of other personal and social factors (50).

The question of employee choice in working hours was also examined in the context of shiftworking (21). Where day, night, and mixed duties were all available, a strong inclination was found towards constancy in work and leisure hours and against the disruptive effects of alternation. The multiplicity of personal and environmental factors which determine differences in individual preference were later examined in detail (26).

'Rapid rotation' in continuous three-shift operation was investigated in a pioneer study and found to be preferred to the more traditional 'week about' method on both social and subjectively-experienced health grounds (59). No evidence of differences in absence behaviour under the two systems was noted. In another three-shift situation (40), short-term absence was used as an indicator of aversion to particular turns of duty over the twenty-four hours, and was found to occur dominantly on the night shift.

All these studies underline the highly particular nature of each working situation. A number of general statements of the problems involved in 'abnormal' arrangements of working hours were also made (19, 23, 24, 25, 45, 52, 57).

Another area of interest altogether concerned human factors in the causation of railway accidents—work carried out under the auspices of an MRC committee on the subject. While some analysis was made of case studies of incidents in which drivers had passed signals at danger, and of the

service histories of the drivers involved, the main approach used was prospective. It entailed an analysis of what is required in the normal performance of the train driver's task and consequent prediction of the errors which are likely to arise in its course. The investigation by experiment under controlled conditions of hypotheses formulated in this way can be more productive than the sifting of information retrospectively collected. This approach to accidents and an analysis of the driver's task were discussed (7, 9, 10, 11).

On the basis of prolonged periods of footplate observation various areas of perceptual error were defined and later investigated under simulated conditions, often using drivers as subjects. A possible source of perceptual error in train driving concerns assessment of position and speed, and one series of experiments illustrated the importance of auditory stimuli in this (8). Subsequent experiments concentrated on the vigilance aspects of the task, reflecting the extent to which technical developments have modified the driver's function from operator to that of monitor (12, 13, 14).

In the light of increasing complexity in the information presented in the form of visual displays, perceptual problems were also studied from the viewpoint of the road user. Special attention was given to advance road direction signs of the type placed before road junctions. Legibility and clarity of various layouts—including those in use in the UK, USA, and on the Continent—were compared by the response of laboratory subjects to signs while performing a central tracking task as a substitute for driving. Experiments on general layout were followed by others concerned with the perception of such display details as upper and lower case lettering and the shape of direction arrows (22, 51, 53, 54, 55, 56, 58).

Problems of presentation and methods of dealing with incoming information were thus studied in the context of both train driving and road transport. Another approach to the processing of information was seen in a programme of laboratory research carried out in the early part of this period, the theoretical aim of which was to increase knowledge about the cognitive processes involved in the response to language (60-62 and 64-67 inclusive). An important part of this line of enquiry concerned negation, the response to which was studied under a variety of conditions. These experiments demonstrated how much more slowly and uncertainly people understand and use negative information than material presented in a positive form.

One highly practical application of such findings is to the language of official instructions. One reason why the man-in-the-street loses his way in the thickets of Ministry prose lies in the need to interpret and recall an increasing number of positive and negative qualifications. An alternative suggested by this research, and since widely adopted, is to present instructions in the form of 'logical trees'—sequences of simple statements for the reader to follow, beginning with the most general and ending with the most particular. They enable negatives and such connecting words as *or*, *if*, *unless*, *except*, to be eliminated (31, 64).

In the area of thinking, experiments in 1962 concerning transfer between conceptual systems had as their setting the proposed conversion to decimal coinage (30). They showed that people would find it easier to

change to a completely new set of coins than to use existing coins in different ways—a finding certainly confirmed by subsequent events.

Under the general heading of skill may be included a range of laboratory and field investigations from various hands during the period under discussion. Topics covered include changes with age in the speed and quality of work among leather cutters (20); conceptual skills in classification tasks of the kind used in inspection (42, 43); proprioceptive factors in muscular skill and in visual judgement of size (68, 69); the effects of alcohol and of certain drugs on car driving behaviour (27, 28, 33); and the effect of heat stress, and acclimatization to this, on performance in various psychological tests.

In the field of training an experimental evaluation was made of various methods for training the middle-aged in inspection work (3, 4), and a survey of training needs was carried out in one industry employing mainly women (1, 2).

A number of methodological contributions were also made (5, 17, 18, 29).

CONCLUSION

In the space available it has not been possible to take more than a quick Cook's tour of the Unit's research in the decade under review. This research ranged widely over the individual, his task, and the environment in which he works. Nor did it neglect those variables in the wider social environment which were considered by Shimmin in her Chairman's address to the Occupational Section of the British Psychological Society in 1962 (46). The interaction between what goes on at work and what occurs outside the workplace is nowhere more clearly seen than in the studies on incentives, overtime, and shiftwork.

The aim of this research was to contribute to the understanding of psychological processes underlying behaviour at work, and to modify work and working surroundings in the interests of effective performance and psycho-physiological well-being. The immediate effect of such research is often barely perceptible. Only by looking back is it possible to appreciate the changes that have taken place in the recognition given to individual human differences at the workplace, and to count the once-revolutionary suggestions that have since slipped quietly into general practice.

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THE MEDICAL RESEARCH COUNCIL APPLIED PSYCHOLOGY UNIT*

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This paper traces the origins of the APU and sketches its development from its foundation in 1944 to the present day. Research in a large number of important areas is outlined, with reference to such areas of work as: environmental and task-induced stress, post office studies, tracking control skills, car driving, signal detection and monitoring.

HISTORICAL NOTE

IN AN EARLIER PAPER on the work of the Applied Psychology Unit, Poulton (1964) traces its origins back to the Industrial Fatigue Research Board. This was set up in World War I to examine the effects of hours of work on health and efficiency, mainly among female munition workers. With its expansion of interests into other industries, the Board became part of the Medical Research Council's organization in 1920, and in 1928 changed its name to the Industrial Health Research Board. Until the outbreak of World War II its interests centred on the physiological, psychological and environmental factors affecting the healthy worker in industry, and a mass of scientific data was collected by the Board's staff. World War II produced a resurgence of earlier industrial problems, e.g. the need to employ vast numbers of women in factories and the difficulty of training inexperienced new workers, particularly those from the higher age-groups. However, it was clear that new problems were arising. In industry and particularly in the Armed Services, the need to operate complex new equipment, sometimes under stress, for prolonged periods and in unusual environmental conditions, produced the need for much more information on human behaviour.

The Board's staff was expanded and deployed to cover this range of new problems. Research was divided into two main areas: that concerned with increasing operational efficiency, safety and comfort, and that concerned with the adaptation of fighting vehicles to the convenience and capabilities of the people using them. Ergonomics was being born, in spirit, if not in name. In fact, a new term 'personnel research' had just been coined to describe this kind of work. The term survives today in the combined Service and civilian committees which were set up to direct wartime research.

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During the early war years, Medical Research Council staff were seconded to these Personnel Research Committees. Their excellent work has been summarised in a post-war report on 'Medical Research in War' (Anon. 1947). This publication amply demonstrates that the traditions of the APU are firmly rooted in studies of real-life problems. This concentration on applied research is very much in evidence today, and the general applicability of any research finding is a major criterion used in selecting topics for study from a wide range of incoming problems, many of which the Unit currently has neither time nor staff to accept.

Formation of the APU: 1944 to 1945

For many years before the war, future members of the APU had been working in the Psychological Laboratory at the University of Cambridge, under the inspiration and guidance of Professor F. C. Bartlett. As the variety of wartime problems grew in range and importance, and more staff were employed, it became necessary to unify the work so that results of industrial research could be applied to relevant Service problems and vice versa. Therefore early in 1944 the MRC established a 'Unit for Research in Applied Psychology' within the University department. The APU had arrived. It was directed by K. J. W. Craik, a man who combined strong interests both in advanced engineering and in the explanation of behaviour: its Honorary Director was Professor Frederic Bartlett, who welcomed and developed the application of experimental psychology to solve problems of man-machine relationships.

Reporting in *Nature* that first year, Craik (1944) pointed out that certain common principles were emerging from the Unit's research, much of which had necessarily been of an *ad hoc* character. With typical foresight he was already anticipating the application of these principles to peacetime problems. Studies of prolonged watch-keeping (Mackworth 1950) were seen to be related to the determination of optimal work-periods in industry. Techniques developed to study fatigue and discomfort (Russell Davis 1948) were suggested as a possible method for assessing progress of patients recovering from physical and mental illness. Work on control problems was obviously applicable to the future design of machine tools and more complex man-machine systems.

If there was a shift in emphasis from earlier days, it was in the prominence Craik gave to the idea of fitting the job to the man, rather than vice versa. As he put it, "This approach . . . puts the industrial jobs necessary for improved standards of living within the power of the majority, whereas psychological selection alone, especially where the job has been made unnecessarily difficult, may result in a high rate of rejection and unemployment." Intelligence testing was continued, however, to meet the need for allocation of workers to tasks which were unavoidably difficult.

It is interesting to note from Craik's report that, of the eleven research staff employed in early 1944, six were graduates in psychology, four in medicine and one in physiology. This selection of Unit staff from a variety of disciplines became wider ranging in later years, when psychologists with

additional qualifications in physics and engineering were employed to deal with increasingly complex problems of control systems.

Tragically, Craik never lived to see his predictions fulfilled. He died in 1945, the victim of a road accident on the day war ended.

The Post-war Years: 1945-1958

The work of the APU continued under the general direction of Sir Frederic Bartlett, with Dr Mackworth as Assistant Director.

Greater emphasis was placed on studies of prolonged visual search. It was recognized (Mackworth 1956) that advancing technology had changed the whole character of the human skills required in industry and the Services. More and more, man was becoming a monitor of complex equipment. The need for research on manual skills was dying and greater attention was being given to perceptual and decision-taking skills. Information relevant to the design of man-machine interfaces was all-important, together with the need to define the limits of human behaviour under stress.

During these early post-war years, research on individual differences continued, although the emphasis shifted to problems of vocational guidance, intelligence and personality testing, and the selection of university students. Individual differences, and the concept of 'accident proneness', were also of central importance to the continuing studies of accident prevention, both in industry and on the road.

However, a number of people were beginning to establish general principles of human behaviour from research using healthy adult subjects. Dr Mackworth continued his studies of perception and decision-taking, with an additional interest in environmental heat and cold. Dr E. C. Poulton developed the concept of 'perceptual anticipation', especially in relation to tracking skill, and Mr D. E. Broadbent began his series of experiments on effects of environmental noise. Mr R. Conrad and Mr C. B. Gibbs, working on industrial productivity, were concentrating on the question of timing in skilled movements. The posthumously published papers of Dr Craik (1947 and 1948) and the work of Dr Hick (1947, 1951, 1952) were already laying the foundations for the important step forward taken by the application of information theory to psychology. Work on environmental heat was being undertaken by Dr A. Carpenter and Mr R. D. Pepler, partly at the Tropical Research Unit which the MRC maintained jointly with the Royal Navy in Singapore. Most of the practical problems were still coming from the Services, usually the Royal Navy or Royal Air Force, but the number of civilian and industrial problems was increasing.

In 1949 pressure for accommodation forced the Unit to expand outside the University and an annexe was established in a large house in the city. The problem of adequate testing facilities was acute, however, and in 1953 the entire Unit moved to its present position in a large house on the outskirts of the city. Dr Mackworth became the director, with Sir Frederic Bartlett and Professor G. C. Drew as consultants.

Towards the end of this period a number of important theories of human behaviour were beginning to emerge from the work of the Unit.

Those connected with the field of attention and memory were reviewed by Broadbent (1958) in his book on *Perception and Communication*, which provided the stimulus for a great deal of research in applied and experimental psychology during subsequent years.

Recent Times: 1958 to 1969

In 1958 Dr Mackworth gave up his directorship and returned to full-time research with the Canadian Defence Research Medical Laboratories in Toronto. His place was taken by Mr Broadbent, with Dr Conrad and Dr Poulton jointly in the position of Assistant Director.

Application of psychological theories. In the Annual Reports circulated during the early years of his directorship, Broadbent selected for attention a range of work on the relation between signal probability and response time. This topic was becoming important to revised concepts of information theory (Broadbent 1957), to research on choice reaction time and stimulus-response compatibility (Leonard 1959), and to the work on industrial inspection tasks which were being initiated by Dr W. P. Colquhoun.

Dr R. T. Wilkinson's research on sleep-loss was of interest to the developing theories of the way in which a man's general level of alertness varied from time to time and interacted with the level of stimulation produced by the task he was performing. Earlier research, which showed that the brain samples sensory information in chunks rather than taking it in continuously, was being related to practical tasks such as the perception of speech. The application of psychological theories to practical problems was apparent in a variety of publications at this time, for example: in Poulton's (1959, 1960) research on the relation between perception of written material and the style of printing used; in Conrad's (1960) research on immediate memory and its application to communications problems such as remembering long telephone numbers; and in Dale's (1959) studies of searching strategies and fault-finding in electronic equipment.

Individual differences. During the early 1960s there was renewed interest in individual differences, as determined by temperament and personality. Colquhoun (1960) was beginning to discover differential changes in vigilance performance among extroverts and introverts, depending upon the time of day at which the task was undertaken. Together with Corcoran (1964) he developed this interest in relation to the physiologically based concept of arousal which was gaining acceptance among psychologists, and Wilkinson (1961) demonstrated the importance of this concept for tasks performed after loss of sleep. Brown and Poulton (1961) were also interested in individual differences, but were concerned with methods for measuring the ability to process information, mainly as a means of assessing performance on tasks which were otherwise difficult to evaluate (Brown 1964).

Information theory reconsidered. More theoretical concepts of information theory continued to be refined (Stone 1960; Bertelson 1961), to take into account effects of sequential probabilities among stimuli in tasks which required serial choice responding. Further modifications to the theory were necessitated by findings which demonstrated that the time taken to respond

to displayed information depended to a large extent on the compatibility between stimulus and response (Broadbent and Gregory 1965a) and upon the discriminability of stimuli (Rabbitt 1963). Conrad (1962) also showed that the linear relationship which had earlier been found between response time and displayed information was drastically altered by prolonged practice at a task. Morton (1964a) found similar inadequacies in the application of information theory to word recognition, which led him (1964b) to develop an alternative model for language behaviour.

RESEARCH ACTIVITIES

Signal Detection and Monitoring

Increasingly the idea was being adopted that perception did not involve stimuli being either definitely received or definitely missed, with no intermediate category (Broadbent and Gregory 1963), but that the brain was making a statistical decision when detecting signals from the environment. Perception was seen to depend upon two important factors: the strength of a signal relative to the noise within the perceptual system, and the perceiver's expectancies about the probability of appearance of signals and 'non-signals'. As Broadbent and Gregory (1965b) showed, these factors can be affected differently by changes in the conditions under which work is performed. This finding has an important practical consequence for evaluations of man-machine systems which involve monitoring, because it is no longer sufficient simply to measure the errors a man makes. One also needs to assess the effects of working conditions on the man's expectancies and the way that changes in these expectancies alter his decision-making criteria.

Later advances in signal detection theory showed that these changes in criteria might be measured by recording the level of confidence with which a man reports his decisions. The theory predicted that shifts in confidence could result in large changes in the number of signals correctly detected, for relatively small changes in the number of false reports. Colquhoun (1967a) was able to verify this prediction, from measurements of performance on a task of sonar target detection. Broadbent (1967) pointed out that it is also a higher level of confidence which produces greater efficiency in reporting probable, rather than improbable, words heard on a noisy telephone line. This effect is clearly important to the design of articulation tests and to the construction of special vocabularies for use in noisy conditions.

Environmental and Task-induced Stress

For a number of years a considerable proportion of the Unit's research was directed at evaluating the effects of various stresses upon working efficiency. During the 1960s, and especially with the acceptance of 'arousal' theories, more systematic studies of interactions between stresses began (Wilkinson 1963). In a review of some of these experiments, Broadbent (1963) argued that it was no longer legitimate to think of a single mechanism mediating reaction to stress. Effects of heat appeared to be independent of those resulting from noise and sleeplessness, and the latter two stressors seemed to have

effects which tended to cancel each other. Incentives, on the other hand, were found to increase the harmful effects of noise (Wilkinson 1963). The practical implication was that one could no longer regard any particular environmental condition by itself as detrimental to performance, without regard to the nature of the task being carried out under that condition. This attitude affected the methodology adopted in studies of real-life stresses. A need was seen for the development of simple tests, designed to be sensitive to specific environmental conditions. Thus Baddeley and Flemming (1967), for example, developed a test of manual dexterity which showed that breathing an oxy-helium mixture at pressure substantially improved the accuracy of divers working 61 m (200 ft) down, as compared with others breathing 'pure' air.

Post Office Studies

With Dr Conrad's appointment as Human Factors Consultant to the General Post Office, a range of problems was dealt with which derived from the need to design communications systems capable of being used efficiently by the majority of the general public. The differences between this range of problems and the more conventional subjects of industrial and engineering psychology have been reviewed by Conrad (1967a). Current research on stimulus-response compatibility, on the role of letter-sequence redundancy in short-term memory and on the conditions for effective recall of letters and digits, was used to advise the Post Office on the design of alpha-numeric postal codes (Conrad 1967b). Research on memory and on stimulus-response compatibility was also used to advise on the design of data-entry keyboards for telephones (Conrad 1966) and for semi-automatic letter-sorting machines. Techniques for measuring recognition memory for words were used by Rabbitt (1966) to study the efficiency of communication over noisy channels.

Conrad's (1963, 1964) research on acoustic confusions in memory also had important practical consequences for the design of communications systems. He showed that when people had to remember visually presented verbal material for brief periods before making a response, their errors resulted from confusions between items in the stimulus vocabulary which sounded alike, rather than between those which looked alike. This implies that designers of visual displays should ensure that signals not only look different from one another, but that the names people give them will also sound different. This is especially important in displays of alpha-numeric material.

Car Driving

Increased attention was also being given to another skill which was involving more and more of the general public: that of car driving. The emphasis here was on studies of conditions likely to cause impairment of skill, such as prolonged driving (Brown *et al.* 1966) or using a mobile telephone (Brown *et al.* 1969), and on techniques which might be used to assess effects of training on individual differences in driving skill (Brown 1968a).

Tracking Control Skills

Training for control skills in tracking was also under investigation by Dr M. Hammerton and Mr A. H. Tickner. The problems of simulator training were given special attention (Hammerton 1966) and doubt was cast on some assumptions previously underlying the design of simulators. For example: in training people on remote control of distant objects it appeared that simulation of the actual physical situation was much more important than simulation of the angular dimensions as projected on the operator's eye (Hammerton 1963; Hammerton and Tickner 1967). The implication was that one could not expect immediate and perfect transfer of training to the real situation when men had been trained on, say, CRT displays. Many of the cues which allow us to perceive spatial relationships are clearly absent during CRT simulation, which prevents perfect acquisition of these remote-control skills, even with prolonged training.

Physiological Rhythms and Shift Work

In the mid-sixties a new interest was taken in the physiological correlates of behaviour. In particular, research was aimed at the effects on performance of physiological changes related to time of day (circadian rhythms). This work was being developed by Mr M. J. F. Blake, just prior to his accidental death in 1965. Blake's data were prepared for publication by Dr Colquhoun (Blake 1967a, 1967b), and produced two important results. Firstly, performance on a wide range of tasks was shown to bear a close relationship to diurnal fluctuations in the man's physiology, as measured by body temperature. Secondly, a significant difference in the phase of the diurnal rhythm of temperature was found between people with extreme high and low scores on the unsociability scale of the Heron Personality Inventory.

As Colquhoun (1967b) has pointed out, there are practical implications here for the design of rotating shift systems, since these temporarily disrupt a person's diurnal rhythm of activation. The findings are also relevant to the selection of personnel best able to operate those shift systems efficiently. Wilkinson and Edwards (1968) have shown that the most important factor in designing work schedules is to stabilize daily shift times, i.e. arrange that a shift occurs continually at the same time of day or night in each successive 24-hr period. This procedure allows people to adapt to working and sleeping at unusual times, with a subsequent improvement in performance, as compared with, say, a weekly shift system, where the man on night shift is just beginning to adapt, physiologically, when he has to revert to day work. This area of research is also of methodological interest to anyone investigating prolonged performance of tasks, since account must be taken of possible interacting effects of time-on-task and time-of-day (Brown 1967).

Design for Everyday Life

Closer links between Britain and Europe during the past few years have renewed concentration on the problems of designing systems which affect all members of the general public. With the growth of international telephony the public has been forced to use telephone numbers which far exceed the

normal memory span for digits. Information has had to be produced on the best methods of dialling or copying these long sequences, e.g. by grouping them in various ways, and on the layout to be used when they are printed in directories, etc. (Conrad and Hull 1969). The design of printed information itself has come in for a good deal of attention (Poulton 1969d) to meet the need for conveying written information rapidly and effectively.

The decision to convert our currency to the decimal system by 1971 also produced its problems for the general public. New shapes and sizes of coins had to be introduced, and Wright (1969a) with others (Wright, Hull and Conrad 1969) compared the merits of some alternative shapes from the point of view of visual and tactile discrimination. Wright and Fox (1969, 1970) also compared performance on the various types of conversion tables which would be needed with the new currency. New decimal postage stamps had to be designed, and Brown and Hull (1971) evaluated the confusability of the colours used within the new range.

Changes in other systems will produce problems for the human operator. For example, with the spread of motorways it becomes increasingly difficult for the police to monitor traffic for offences and accidents. One solution is the greater use of surveillance by closed-circuit television. This raises questions on the best way of arranging the monitor screens so that the displays from a large number of cameras beside the road can be watched efficiently and incidents reported with minimum delay. Tickner and Poulton (1968) have published some initial findings on these queries.

Publications

APU staff are currently publishing around fifty papers annually in scientific journals, reflecting the balance between the Unit's applied and academic interests and the diversity of special interests among APU staff: in problems of ageing, deafness, skindiving, etc. In addition to journal publications, papers are published in Proceedings of scientific meetings, and chapters are written for text-books on a variety of psychological topics. Complete books have been produced by Bartlett (1951, 1958) and Broadbent (1958, 1961, 1971) and a further two are in preparation.

It has become the custom to produce at short intervals an updated list of all APU reports, published and unpublished, since the Unit's foundation. Interested readers may obtain copies of these lists from the Unit librarian. An additional method of disseminating information on APU work is to circulate its annual 'Human Performance Reports' to around 1,000 people on the Unit's mailing list. This allows readers to identify and send for offprints of specific interest and to receive notice of completed work which is being prepared for publication.

Personnel

The number of scientific staff has varied very little in the past twelve years. Increase in staff has arisen mainly from the greater number of technical staff employed since 1956. The majority of these new technical staff are employed as research assistants, who of course free the scientists from

the burden of repetitive testing. The scientific staff is currently at the beginning of a phase of expansion, which will necessitate complementary increases in accommodation, additional to those completed on the Chaucer Road site in 1968. A new departure in staffing is the attachment of Unit members to other research establishments, e.g. Dr Conrad to the Nuffield Hearing and Speech Centre and Dr S. D. G. Stephens to the National Physical Laboratory, where their developing interests can be matched by established research facilities or subject populations.

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BEYOND INDUSTRIAL PSYCHOLOGY*

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THE PERIOD IN THIS COUNTRY between the two World Wars was a time of vigorous and far-reaching activity in the field of industrial psychology, and Myers through the National Institute of Industrial Psychology was in the thick of it. The area of work encompassed was wide, entering into almost every human facet of industry. Nevertheless from the time of the Second World War, whilst the traditional pre-war interests continued and expanded, new trends emerged. Although they sprang directly from the background of classical industrial psychology, it would be misleading to subsume the themes of this new interest under the formal title: Industrial Psychology. It has become known variously and uneasily, as Human Engineering, Engineering Psychology, Human Factors Research, and doubtless much else.

I believe that yet another phase of this science is now beginning which is neither quite usefully called industrial psychology, nor quite usefully regarded as engineering psychology, but which remains just the same in direct lineal descent. I want to devote the main part of this Lecture to tracing the outlines of this history; sketchily for the early part because so much is already recorded in the text books; in somewhat more depth for the second part, because this is still being amplified and elaborated, and is also continuing to generate new problems; and hazily for the newest part because I don't know where it is going. But there I intend to take the time to exemplify through some current research, what seems to me to be at least one central direction that has by no means yet reached an end.

* * * *

In trying to specify the essential subject matter of industrial psychology, one is immediately struck by the breadth and variety of the topics which have been actively studied. A very large proportion of this work can reasonably be included under the headings of the technological and the social environments and their effects on industrial efficiency. Certainly glancing through the reports issued by the Industrial Health Research Board and by the National Institute of Industrial Psychology between the two World Wars, one has under one's hand an almost complete framework of modern industrial psychology.

*This, the third Myers Memorial Lecture, was delivered in Liverpool on 14 February 1967, and published in *Bull. Br. psychol. Soc.*, 20 (67), 1-12. It is reprinted with permission.

There were the classical studies of the physical environment; of temperature, illumination, ventilation, noise, vibration, dust; and we can add to these, environments such as zero gravity, acceleration, compressed air, the depths of the sea, all of which remain areas of expanding research and application. Within this group, in many ways disappointing in terms of applicable results, lies the bitter problem of industrial accidents which is now beginning seriously to hit developing countries.

Equally well known and supported are those topics which relate to the role of the workers' social environment: the social relationships with his colleagues and superiors, the effects of different methods of payment, and the much more recent—indeed tardy—development concerned with shift systems, which fascinatingly links shop floor practice directly with physiological processes, through studies of the nature of human diurnal rhythm. Continuing technological revolution has thrown up old problems in new guises.

As early as 1926, Legros and Weston published a report in the Industrial Health Research Board series, concerned with machine design looked at from the stand point of the machine operator, but it turned out to be an isolated *tour de force*. Perhaps there was inadequate preparation of the social climate; or more likely, industrial psychology of the time was completely absorbed with the exciting new experimental and observational techniques that were being used at shop floor level to highlight the importance for working efficiency of the physical environment. Whatever the reasons, this first *essai* into engineering psychology fell flat. Then with practically no intervening history, twenty years later at Cambridge, Craik was enthusing his colleagues with his developing concepts of the machine operator, whom he saw not as an independent attachment to, or mere minder of a machine, but as an integral and dynamic link in a man-machine system (Craik, 1947, 1948). Today this is such a common notion in psychology that it is hard to imagine why it took so long to be formulated.

This new thinking fully accepted the importance of the machine operator's social and physical environment, but its implications went much further. Machines, it pointed out, are operated by men, yet designed by engineers who know little about the relevant nature of those men. It was therefore pure chance whether the machines' demands on human ability matched the abilities that operators had to offer. Even at the most basic level there was little systematic attempt to take into account such elementary considerations as the shape of the human operator. Crucial controls were placed beyond the physical arm's reach of a normal sized man in his normal operating position.

Engineering psychology (as I think I had better continue to call it) is concerned then with the study of the behaviour and abilities of people in an operating relationship to machines, equipment and larger technologically purposive systems such as power production, air traffic control, train signalling and so on. It is called upon to provide the appropriate biological data which together with engineering data will be used to ensure that a particular man-machine system will operate efficiently. Functions are allocated on the

basis of these data. The man, for example, provides the decision-making skills and his vast store of memorized experience; and the designer harnesses this to the physical strength, the precise rapid repetitive power and the multi-channel capacities of machines. The vanguard of the subject is now involved with problems of which functions to allot to man and which to machine, or with where the balance lies between the respective monitoring functions of men and machines on each other.

To take one example, consider an aircraft with several hundred passengers or merely valuable freight. That aircraft to all intents and purposes can now fly itself, navigate itself and land itself with no human control. But one malfunction of its equipment could mean certain disaster. The machine must be monitored by a man ready to take over in an emergency. But this man must have a level of skill which will permit him to do all that the machine does. He will be an expensive man. Emergencies will occur rarely. Will the man be able to remain alert for long emergency-free periods—and at the critical moment be able to step in and take over just at that point where the machine has failed? On the other hand, machines with their exceptional capacity for merely continuing, make excellent monitors. Why not let the man, who anyway has the skill, do the flying, and the machine the monitoring? As soon as the man's control moves outside of defined margins, the machine, which has been keeping unflagging continuous track of the state of affairs, can move in and take over. Will this be a better solution to the problem of designing error free aircraft? What kinds of difficulties will arise at the moment of dual control? How much override should men and machines have on each other?

This is just one advanced problem in engineering psychology; there is also a great deal of activity at a more humdrum level. I refer to the relatively simple questions of what kinds of device to provide for controlling moving parts of a machine or controlling processes of a system: when to use wheels and when to use levers; what size they should be; what forces should be required. In the present state of knowledge the questions are simple, but they are not trivial. It is not acceptable that decisions on these matters be left casually to a junior draughtsman.

Of similar concern is that whole set of problems which relates to ways of providing to operators information which is not directly accessible to their unaided senses: how to indicate aircraft altitude or steam pressure; how to display to a signalman information regarding the whereabouts of trains, or to a navigator the whereabouts and nature of distant hazards. When sense organs are used to observe the translated state of a physical system many problems arise, the solution of which are the province of engineering psychology, and the basic data which the engineering psychologist uses are principally the nature of the sense organs themselves together with classical but up-dated theoretical concepts of sensory perception. These data, related to the practicable kinds of sensory inputs, permit statements to be made of the acceptable range both of quantity and quality, to which the inputs must be confined if the operator and the machine or equipment he is operating are to be considered as an efficient dynamic system.

Biological data, engineering design data and costs form the cornerstones of good equipment and system design. It is not so much the principles, as the quantities deriving from the principles which are important here. A space capsule can be designed for men up to 5 ft. 9 ins. tall—or at extra cost for men up to 6 ft. tall. For that extra cost how many more men become available? Telephones can at a cost be fitted with a volume control. For that cost, how many people will positively benefit? At a cost, error checking procedures can be incorporated into the use of computer codes. For that cost, how many errors would be detected which would otherwise enter the system? Lines can only be drawn on the basis of quantitative performance data. The principle that a stitch in time saves nine, is far too vague to be useful in the context of precise engineering data. The designer needs to know the complete function of saving against time, so that he can accurately optimise between spending resources on people or spending them on hardware. The feedback lag is often too long for trial and error. It may be years for instance before a series of aircraft crashes can confidently be attributed to a hard-to-read altimeter rather than to an unconnected number of chance events.

I began by referring to the problems and province of classical industrial psychology as Myers knew it. Then I tried to show how the growing complexity of machines and equipments, greater concern for safety, the increasing shortage of suitable people, have supported the development of new fields of psychology based on a new conception of the role of the operator. For a good many years, it has no longer been possible, and certainly not effective, for a works manager to regard himself as an expert on environmental climate, shift systems, payment systems, training schemes and so on. It is now becoming impossible for the equipment designer when thinking about the human components of his design, to regard himself as equivalent for all psychological purposes to the so-called average operator. Where working conditions and equipment design are concerned, the concept that every manager and every designer can be his own psychologist is fast becoming laughable.

* * * *

This brings me to the third, more recent, development in this science of man that I earlier confessed I could not even name. In this area practically everyone is still hopefully and ignorantly being his own psychologist, and we are only just beginning to recognize the existence of the resulting problem.

To provide a background, let me remind you that it is far cheaper for a computer or automatic reading device to accept, store and process short alphanumeric sequences, than lengthy and various names and addresses or other verbal descriptions. We can therefore be quite sure that more and more descriptions of items and persons will be expressed in code form; more and more communications between people will use codes; and people will increasingly communicate with machines and complex systems using a language consisting only of alphanumeric codes. In brief, we are entering an era when almost every person in the country will be increasingly involved in writing down alphanumeric codes in order to initiate a communication transaction of one kind or another.

The size of this problem from the point of view of one single—if large—agency, the Post Office, is startling. Forgetting telephone calls which do not normally require writing, every year there are 90 million across-the-counter Post Office Savings Bank transactions, nearly 500 million National Insurance payments, and 11,000 million items of mail excluding parcels are addressed. Shortly the new Giro system for money transactions without using bank cheques will be introduced. All of these operations, when automation is completed, will require a customer—that is the general public—to write down crucial information in code form.

We might well ask: how good are people at merely copying a string of letters or digits? We have carried out a number of experiments at Cambridge in which housewives were asked to do just that under a variety of controlled conditions. The general procedure was the same in all cases. Subjects were given sheets of paper with sequences printed in a column down one side and they were told to copy them quickly and accurately in a space somewhere on the same sheet of paper. The first test used number sequences which were either 3, 6, 9, or 12 digits long, and these were copied at the end of the line. We know it is human to err, but how much error would we expect in so simple a task? Well on average, 18 codes out of every 1000 were wrong; and increasing code length from 3 digits to 12 (a factor of 4) led to twelve times as much error to reach 42 wrong codes per 1000. I might mention here that subscriber-dialled international telephone numbers will be no more than 15 digits in length. My AA membership number has 13 characters. Our test was not exaggerating.

The second test asked what would happen if we reduced the distance between the original and the copy. Another group of about fifty housewives copied the same sequences, but instead of copying at the end of the line, copied immediately beneath. These codes were copied with only half the number of errors. So this is another piece of design information that can immediately be used.

A third test looked at differences between copying digits and copying letters. The reason for this test was that codes are often designed which use classificatory letters which are meaningful to management but have no meaning for the general public using the codes. Management may pay a high price for this, for we found two to three times as many wrong letters as wrong digits, and, of course, letter codes were also copied much more slowly (Conrad and Hull, 1967).

If these laboratory data provide any clues at all to the performance levels to be expected in the everyday operational situation I referred to, it is clear that costly error checking procedures may have to be built into these systems, and a balance struck between the cost of these procedures and the costs in other forms, of letting errors through. I know of only one set of operational data with which our laboratory results can be compared. A European Giro system has in practice found 5 wrong codes per 1000 when a six-digit code was used. Our laboratory value for a six-digit code was 10 per 1000. The difference is hardly great enough for complacency, and is encouraging as a pointer to the value of these relatively simple laboratory

studies for acquiring this kind of data which is otherwise so difficult to obtain.

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I have stated in a nutshell a whole new area for psychological research. But in case this is a little too cryptic, I had better expand. Explicitly, both industrial and engineering psychology have been concerned with the performance, efficiency and well-being of people, who are in fact paid professionals. These people work in highly circumscribed defined situations. Where possible they are specifically and carefully selected for the particular jobs, and almost always they receive some degree of specialized training for the task. The subject matter of our science so far, consists of a selected population, identifiable and accessible, and trained.

But as I have suggested in the code example—to use a term coined by Bartlett—the technologically prepared situation is fast spreading from an involvement merely of specific occupational populations, to include all responsible members of our highly advanced complex society. In an increasing number of ways, the general public are becoming ‘operatives’ in massive technological systems, and carry out defined technical operations. Each such operative spends only a very small amount of his daily life in this occupation, but the total number of operations that are carried out by this unselected and untrained population is vast. Though the probability of error on any single occasion is quite small, the overall cost whichever way it is measured may be immense.

Consider another quite undramatic case. The Post Office provides a free directory enquiry service. Annually 130 million directory enquiry calls are made, at an overall cost to the Post Office of some £4½ million. Almost half of the enquiries are for numbers which are in fact in the appropriate current local directory. Somewhere evidently, there is an expensive mismatch between the way telephone-number information is provided for telephone users, and the abilities of the public to make use of that information. The mismatch shows in the fact that substantially, either people are not looking for numbers in a directory, or are looking and not finding what is there. This situation poses a number of problems some of which are typical of those dealt with by conventional industrial or engineering psychology. But with a difference that management in the Post Office has little control over the conditions in which each specific operation of trying to find a number is carried out; it cannot disqualify unsuitable ‘operatives’, its opportunities for training are exceedingly limited, and feedback of the results of educational efforts, or indeed any changes in the design of the system, is another case which may require years to become evident.

One way into this problem concerns the way in which subscribers approach the task of finding a telephone number. It may be that the accepted alphabetical name logic is not the most helpful from the point of view of the strategies that people customarily use. For example it might be more useful if subscribers whose entries carried a trade description, such as Smith, J. Butcher, were separately listed from the private residential entries. In this instance, J. Smith apparently assumes that people think of him primarily as a

butcher. If he is right, then he might be easier to find if listed amongst a set of tradesmen Smiths, than amongst all Smiths. Government and Local Authority numbers could also be a separate category, and so on. We know from our experiments, that the time to locate a number in a telephone directory depends on the number of entries. One might suppose that the longer it took to find a number, the more likely people would be to abandon the search and call directory enquiries. Searching only a defined subset of entries should therefore help; but we need first to know whether there are widely accepted categories of subset of the kind I've mentioned.

A more simple-minded approach is just to consider the visual format of the directory. We are currently engaged on experiments concerned with type size, type style, number of columns, the usefulness of repeating common surnames and a number of other factors which seem relevant to the time required to find an entry. A further approach might be to exploit such small training potential as exists. Standard telephone directories have a section entitled 'How to make a call'. Possibly they should also have one entitled 'How to use this directory'. Though I doubt very much whether the people who most need to, do actually read introductory pages.

My final illustration describes a research programme which effectively epitomizes the general research area that I am trying to characterize.

In essence this research asks the question: why is telephoning so difficult? The evidence that it is difficult for some people comes from the statistical details of human error which the Post Office routinely collects. The following categories account for many of these errors, and doubtless we can all remember being guilty at some time or other: dialling a number incompletely and waiting for something to happen; abandoning the dialling process before completing it and then starting again; dialling a number which does not exist; dialling a number which does exist, but is not the one you want. These errors contain a large forgetting component, and must be considered as examples of man-system mismatch. This is because memory for digits depends only partly on the memorizing ability that people bring to the task. It also depends on the character of the digit sequence and within certain limits this is under control. So when for instance people omit all or part of the trunk code, the system cannot just say that people are forgetful and shrug off all responsibility. If, as is true, people are forgetful, then the cost to the system of that forgetfulness must be weighed against the cost of other possible procedures which would relieve the subscriber of some of the burden of remembering.

It is only when the managers of a system decide that at some part of the total operation the cost of human error is too great, that the psychologist can begin to contribute something. The first detailed question our research asks, is who makes telephone calls and how? Now we have to remember that overall, 75 per cent of homes in the United Kingdom do not have a telephone. But of the people who live in these telephoneless homes, some use a telephone at their place of work. The remainder, if they make a telephone call at all, in general have to use a coin box. These last, from the simple statistics of the situation, are probably more than half of the population. But telephone

calls from coin boxes represent only about 10 per cent of all calls. One begins to suspect that telephone users form two distinct populations: a relatively small group making many calls—that is highly experienced; and a large group of people each of whom makes a few calls—these people are relatively inexperienced. We can be fairly certain that somewhere beyond is a group of adults who never ever make a telephone call.

The first part of the project then, involves more or less natural history. We want to know how many people never use the system at all; try to get some idea of who these people are, and try to determine homogeneous categories of reasons for abstention. We have no idea of the size of this group: by its nature no mass technological system can, through its operations ever know this important quantity—the number of abstainers. Neither the Post Office, nor any public transport undertaking, nor any highway system, knows the number of potential users who abstain. Indeed they rarely know the number of different users, since their operations are generally defined in terms of use-units like telephone calls, or tickets or vehicles per hour. Yet the abstainers, implying a deliberate non-use of the system, may be of immense psychological importance, since they may indicate a man-system interface of literally intolerable mismatch. If it turns out that this interface is of some significant size, this clearly is the surface for which psychological attention is desperately needed unless we are simply prepared to abandon or disqualify these people. Their identification is quite simply made by random sampling and market survey.

Secondly, and still in natural history, we can directly observe and classify the behaviour of people when they do reach the man-system interface. I refer here to the events between lifting a telephone to initiate a call, and either reaching the desired connection, or abandoning the attempt; and we should note that many attempts are reasonably abandoned because the called person is engaged or out. Here we can observe—to some extent automatically—the digits dialled, the amount of time involved, the kind of signal tone returned, the amount of time for which the subscriber listens to the signal tone, and the appropriateness of his reaction to that signal tone. In particular we can compare in this context, the behaviour of experienced business and residential users, with coin box users. At this surface we are in a position to define specific points of mismatch—that is, sources of difficulty. I expect that we shall find problems concerned with finding numbers, with handling numbers, with interpreting signal tones, and with system logic.

The third part of our programme consists of experimental studies relating to these problems. I referred earlier to one of these when I discussed the format of telephone directories. Another is number handling, using, remembering. This is a many sided problem since numbering systems have always tagged along behind engineering developments resulting from continuous growth. Hardware requirements have always been given greater consideration than human requirements. I think this is wrong in this kind of system, and I believe that the all-figure numbering logic that will shortly be common will lead to a generation of headaches both amongst managers of the telephone system and users of it. Nevertheless within this now frozen logic, a good deal

of first-aid may be possible. We begin, from many general studies, to know a good deal about the conditions for minimizing memory errors and copying errors. Our programme will use this knowledge in a specific telephoning situation to see whether laboratory differences which are statistically significant are also in practice psychologically and economically significant. For example, when numbers are printed in directories, or when operators verbally report numbers to customers, it may be worthwhile to abandon digit grouping based on the logic of the telephone network, in favour of groupings found to be optimum in other situations. For example my laboratory number is known (in STD form) as OCA3 55294. Would it be easier for people in the form: OCA 355 294? (Conrad and Hull, 1969).

The problem of interpreting signal tones is psychologically an intriguing one. You take a course of action; the effect of that action is reported to you mechanically in the form of one of a set of sounds. The set is small enough so that from memory, the frequent telephone user can discriminate one sound from the others, and identify its meaning by reference to a verbal tag. He might say "that sound is not ringing tone, but engaged tone". The task only becomes difficult for the infrequent user who may not remember ever having heard a particular tone before—indeed he may not have heard it. In an experiment in our laboratory, we played tape recordings of foreign signal tones to housewives. Some 80 per cent of them thought that the French ringing tone meant engaged, and would have hung up. The Post Office solution is to provide verbal descriptions to which the user can refer, or which he can memorize in advance; descriptions like 'burr-burr' or 'rapid pips'. It may be that this is the best possible kind of description to use. But there is a good deal of circumstantial evidence to suggest that tone interpretation is a serious source of difficulty. We intend to examine the size of this problem, and to consider a number of possible solutions.

Finally then the question of system logic, and whether the sequential steps together with the sometimes necessary branch sequences, form a logical arrangement that most people can comprehend. For instance it is not logically necessary—although it is electro-mechanically necessary—to lift the telephone before dialling; people have to learn this. They have to learn that the system designates other people by numeral sequences rather than by name. In a coin box they have to learn that coins are not required until someone answers. These, and the many other procedures involved in establishing a connection, are not logically inherent in the situation. It is evident that the printed instructions provided are inadequate in some way to a substantial number of people. The language may be too difficult; the indications for a branching sequence may be too obscure; people may need to know when to call the operator, as well as how to call (Wright, 1969).

The ideal man-system interface should, of course, be governed by, as it were, an inescapable logic. That is, at any point in the procedural sequence there should be only a single probable course of action to which the user is led by the operation of a population stereotype. By this I mean a particular response to a situation which most people without thinking about it will make. A kind of instinctive response, like banging a vending machine

that won't vend. In the coin box situation we need to know what at any point people expect to do, and what as a result they expect to happen.

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I want to reiterate and emphasize what seems to me to be the single largest area of neglect in this whole business of people and systems. Designers of these mass systems which involve so very many people, continue flagrantly to ignore the significance of what we know they know, that people make mistakes. It is all too easy to illustrate this point. I would prefer to cite a case where this knowledge was not ignored. This concerns the design of the new postal codes which the public will be asked to add to the normal address on envelopes.

Clearly the design of a suitable code would be constrained by a number of operational factors. One of them was that errors in writing the code should be as few as possible. This problem, like most major system changes was foreseen several years before postal codes were actually introduced to the public. The practicable alternatives were discussed and a substantial experimental research programme set up (Conrad, 1962; Baddeley, Conrad and Hull, 1965). This programme was concerned in a general way, with clarifying the psychological processes involved when people use alphabetic and numeric codes, and was charged specifically with suggesting optimum practicable codes. As a result of this procedure, it seems highly likely that the postal code which shortly will be in wide use, will from the user's viewpoint be exceedingly difficult to improve upon, granted the operational requirements. The main feature of this code of relevance at this moment, is that it uses letters of the alphabet in combinations which are already familiar to the public, such as NOR in Norwich, or CAM in Cambridge addresses. But, in order to do this, it has to have access to all the letters of the alphabet.

Now another operational requirement was that the code should be suitable for recognition by an automatic reading device when an economically feasible one was available. By the time our research programme was able to specify what we considered to be the optimum code, such a device had in fact just become available. But it could not read our code. It could reliably read only about sixteen alphabetic characters. This would have meant abandoning familiar combinations of letters and codes would have had to be restricted to random letter sequences. Our research had already shown that in use, such codes would have a significantly greater liability to error. Simplifying, the decision was between an inefficient cheap code now, or an efficient code which might become cheap at a later date when automatic reading-devices were improved. The decision made put the onus of adapting on the machine not on the people. And this was right. When other things are equal, or cannot be assessed, and the question is asked: do we favour people or do we favour machines, the human factor must dominate; if for no other reason, because machine technology advances so rapidly that today's limitations may be insignificant tomorrow. No amount of wishful thinking will make that true of people.

The need for a psychological discipline which can examine problems beyond industrial psychology and beyond engineering psychology is essential

to my theme. This kind of interaction between the public and, generally, State-run complex technological systems presents psychologists with problems which frequently cannot be investigated entirely by reference to traditional procedures and philosophy. The fact that formal training opportunities are minimal, are casual and even haphazard to the extent that one has no idea as to whether or not trainees are, so to speak, listening; the fact that everyone has, in effect, a social right to sign on as an operative, and to involve the system in a cost if he is a poor operative; the fact that nearly always these systems provide at least some element of social service so that inability to use the system involves a degree of disqualification when any degree is socially unacceptable; these facts surely present psychologists with a rich and formidable challenge.

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SOME FUTURE DEVELOPMENTS IN OCCUPATIONAL PSYCHOLOGY

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"As regards the future, the expansion of Industrial Psychology seems to me assured, though, owing to the innate conservatism of our race, progress may be rather slow."

H. M. VERNON (1948)

THE IMPORTANT POINT of this quotation is who said it and when. H. M. Vernon had given up his Fellowship at Magdalen College, Oxford in 1919 to join the newly formed Industrial Fatigue Research Board. It must have seemed a rash step and thirty years later he had every reason to appreciate the 'innate conservatism of our race', particularly after the war of 1939-45 had seen us repeat so many of the industrial mistakes of the 1914-18 war. Nevertheless progress had been made, new fields of psychology had been opened up in industrial settings and new methods had been developed for their study.

When we consider advances since 1948 and try to project the future scene one point stands out—the most important influence will arise from *outside* the subject of psychology. This may seem discouraging, even depressing. It does not sound the note of a science or technology inevitably determining its own rate of advancement by the light of its own discoveries. But, in reality, this has rarely been the case; many an advance has had to lie dormant until the time was ripe. This point is particularly applicable to occupational psychology, which will always be sensitive to the changing systems and values of society. There is every reason for welcoming this influence over the next thirty years and for believing that it will accelerate the growth of our subject and the demand for it. Throughout the next decades we can expect society to place increasing emphasis upon the quality of life which industry has to offer its workers. The day's work will be viewed in the context of the total life of an individual and psychologists will be asked to face the problems which will arise from planning their subject in this wider context.

Of course there are always plenty of precedents for any trend and many readers will rightly feel that this has all happened before. Social reformers have discussed it for centuries and contributors to this Journal have foreseen the need for such a development. Nigel Balchin (1947), in a

most forward-looking article, discussed incentives in terms of a man working because he must, or because he should, or because he wants to. He argued that we should seek to abolish those factors which distinguish work from pleasure and seek to employ the vast human energies in ways at once satisfying and productive. Today we may be saying little more than this (Herzberg, Mausner and Snyderman 1959; Vroom 1969), but the point is that change now seems more probable as people at every level in industry, business and government come to appreciate the need for better human relations.

This appreciation is quite different from the more straightforward approach of the human relations 'school' (Mayo 1933). We can no longer hold that social relationships themselves are a primary motivating force for all people. Just as research workers have to split the 'average worker' of scientific-management days into different categories on the basis of his capability and skill, so too do we look for variations between people in the value they place upon different features of their job (Goldthorpe *et al.* 1968; Turner and Lawrence 1965).

In noting that occupational psychology will largely be at the mercy of outside forces we must not omit economic influences. In more profitable, easy-going times the development and operation of an organization is different from what occurs in defensive or intensely competitive conditions. We have become accustomed to thinking about individuals in terms of their hierarchy of needs (Maslow 1970) so that lower-level needs have to be satisfied before more intrinsic forms of motivation come into play; perhaps we should also think of organizations in these motivational terms. If they are having to struggle to satisfy their lower-level self-maintenance needs, then we cannot expect them to direct much of their energy to social or self-actualizing behaviours. This implies that much of the psychological content of 'good management practice' or 'good organizational structure' has to be viewed against a background of national economic conditions.

Technology and Size

It is becoming customary to conceptualize many research problems in terms of 'mediating', 'moderating' or 'intervening' factors. Thus we say that the effects of participation are mediated by the type of decision to be reached or by participants' personality (Vroom 1969), or that the relationship between group cohesiveness and output is mediated by the value structure of the group (Schachter *et al.* 1951).

Variables concerned with technology have received increasing emphasis for their mediating effect on relationships between psychological factors (Hickson, Pugh and Pheysey 1969; Woodward 1965). We are slowly learning about the dimensions and measurement of technological features and about the way they influence behaviour within an organization. To learn more in this field must be a major goal for occupational psychology in the near future. In particular we must think beyond production technology in the form of materials handling and change, and turn to the technological aspects of information-processing. Psychology has much to contribute here and we shall return to the topic later.

The technology of an organization is closely linked to its size. There is today an acceptance of the gospel according to size—the bigger the better—and this runs through our thinking about firms and machines, tankers and aeroplanes, schools and universities. Size is a status symbol, yet it is astonishing how little research has been carried out into optimum size and how much the matter has been decided by economic considerations. There is an urgent need for more research like that summarized by Porter and Lawler (1965) into the psychological structure of bigger organizations and into the consequences which follow from their size. We continue to build new schools, universities and cities, without any hard data on the effects of their size and design or without knowing the pattern of interpersonal relations in the organizations we create. The notice board is no substitute for frequent informal meetings and the management information system is rarely as convincing as first-hand material or facts from a respected colleague.

Yet large organizations are clearly here to stay and in many cases they will be transnational ones. The psychological problems arising in these companies are likely to differ in many interesting respects from the usual questions of concern to occupational psychologists, and work on them is only just beginning. A related feature is the growth of transnational trade unions of enormous size. Not only will the power of the parties in negotiation be much inflated but so also will the possibilities for misunderstanding and mistrust.

Closely linked to the problem of the size of units is that of population growth and sprawling urbanization. Britain, particularly in its south-eastern region, will face increasing difficulties as its housing regions stretch ever further from a worker's industrial base and the number of motor vehicles continues inexorably to rise. A whole group of new issues will be associated with these factors; for example, should workers have longer shift hours and fewer days per week, say a four-day week of nine to ten hours per day? If such a situation arises there will soon be problems of how workers spend their leisure time and of the resources for holidays. Above all there will be an emphasis upon the kind of environment which industry is creating both for its immediate workers and the general population who live near it. On this question psychologists should have a leading influence. We have played a relatively minor role in the planning field but with our techniques for studying the individual we could make valuable contributions to it.

Education and Training

Perhaps no organizational function has changed so much in the 1960's as that of training. Psychology had already given much attention to the process of learning but industry itself had generally devoted little of its resources to the subject. The situation was parallel to that which now exists in education: little is spent on research into educational methods but these methods are employed on an increasing scale. The industrial situation was, however, transformed by the Industrial Training Act of 1964 and an area of considerable activity has opened up. As one might expect, many of the present writers on training are discovering what was never lost and often claiming successes

which are unlikely to be the result of the particular method being investigated. Nevertheless, the overall effect of this attention to training has been to raise the standard of industrial methods and to ensure that any self-respecting scheme states its objectives clearly in operational terms. Today training programmes attempt to put forward their various steps in a related sequence and to ensure by feedback that both students and instructors are able to check progress.

It is as well that these foundations have been made secure, for many new problems arise as new jobs are created. Hitherto the psychologist, thinking about how man can best control equipment, has had to concentrate upon the physical features of technology and the compatibility of controls with the responses which the operator had to make. Some basic psychological relationships have been discovered and sometimes the principles have been incorporated into mechanical systems (Singleton, Easterby and Whitfield 1967). But the man-machine interface is rapidly becoming more complex and today the basic issues centre on how man can best communicate with machines, at what points he should be in control, how much information an operator can usefully handle, and how we reconcile the totally different time characteristics of man and computer. As machines make deeper inroads into the time-space dimension man will have to call on more machines to enable him to exercise control. Man can only 'guide' in circumstances where another machine system is performing the calculations for him. In other words the psychologist will be concerned with ensuring that the man-machine interface is as complementary as possible and, in particular, that the machine will be called upon to do that part of the task where man is inevitably slow. This applies across a whole range of tasks performed by computer—from handling of data for a national network to controlling the landing of aircraft, from analysing meteorological charts to ensuring that the melt of a steel furnace is to the required standard.

There is a further feature of training which will become increasingly important. Technological progress has already brought about a rate of change in our society such that no worker, whatever the status of his job, can expect it to go unchanged during his life. The machinery he controls and the processes which are carried out will be restyled and often changed so radically that they become different operations. This implies the introduction of repeated retraining programmes which in turn will become part of an institutionalized re-education system. We are witnessing the end of the once-and-for-all education period when the young adolescent was supposed to take in all that was necessary for him to know for the rest of his life. Today the idea should be as dead as the once a week bath-night in the kitchen. The average worker can expect to have to retrain for a completely new operation at least once during his life time; and the average professional will find radically new procedures being introduced into his work which will require him to acquire and use quite new knowledge.

This increasing importance of re-education will be one of the major changes in the future. It will revolutionize our concept of technological colleges and universities and introduce into them a post-experience population

which will have much to contribute as well as to learn. The university campus will be all the wiser for such people. It is pleasing to note that up to now retraining has received more attention, in both practice and theory, from industry than from education; it is to be hoped that education will not lag far behind.

As psychologists we should not underestimate the significance of what is being proposed. Man represents a biological learning system which implies that he sees the new in terms of the old; he reaches a maximum learning efficiency in his early years and thereafter we have to turn to other qualities such as motivation and experience if the older person is to learn as successfully as the young. Fortunately we have sufficient knowledge about ageing to appreciate the need for preparing in early life for its attendant problems; this implies that both industry and the unions would be wise to insist that this early training is kept as broad as possible.

At management levels too the educational expansion will gradually assume much greater significance. It has long been the cry that British managers are untrained and uneducated, but this charge is now losing its force. Our younger managers have received much more formal schooling than their older counterparts, and as we have seen, the Industrial Training Act has markedly increased the quantity of job-related instruction which is provided. Furthermore the broader types of management education in business schools, polytechnics and universities are now beginning to influence attitudes and behaviour on a considerable scale. We should note with some concern as well as satisfaction the fact that 'behavioural science' subjects are more commonly taught in management studies departments than is any other single subject (Rose 1970). There is no doubt that the educated manager feels and reacts differently from his practical but untutored colleague, but these differences and their implications have yet to be explored in any detail.

Industrial Relations

Occupational psychologists can feel some pride in their work in the fields of training and education, and readers of this Journal do not need reminding of their contributions to practical decision-making in the areas of selection and vocational guidance. But there is one area where their lack of understanding and influence is very apparent. This is the territory usually staked out as 'industrial relations'. Economists, lawyers, historians, political scientists and sociologists are all established here in their expert roles. Their interest is usually defined in terms of learning about the formal and informal rules governing behaviour at work, but in practice the modal industrial relations investigation is still into one aspect of trade unionism, that of collective bargaining and the determination of incomes (Flanders 1969; Roberts 1968).

This concentration of effort is all to the good, but it is distressing to see how little attention psychologists have paid to these questions (*cf.* Walton and McKersie 1965). In both national and personal terms industrial relations are of vital significance. It takes little imagination for a psychologist

to assert that industrial relations are in the last resort human relations, but having stated this truism, he must be prepared to do something about it.

Why have occupational psychologists done so little in this field? Partly no doubt because of the delicacy and sensitivity of the issues involved: one false move by an investigator can be disastrous. There are also grave difficulties of a methodological kind. It is hard, however, to avoid the conclusion that the opportunities, including the financial opportunities, have been lacking. In general, occupational psychology has developed along lines which governmental or industrial sponsors have proved willing to support; so far there has not been much encouragement for psychological work in industrial relations. Perhaps we have to learn salesmanship as well as psychology.

Attitudes and their Measurement

One example of psychologists' work following available resources is in the field of attitude measurement. Over the last five years or so industrial sponsorship of attitude surveys in this country has increased greatly. We will briefly examine this development since it is of value to relate it to trends in psychology as a whole.

The concept of attitude has long been central to psychology, and a couple of decades ago there was a close similarity between the aims and content of the academic and the applied investigations. Then came the evidence (at the time apparently unequivocal) that attitude to work was unrelated to performance at work (Brayfield and Crockett 1955; Vroom 1964) and the development of a general feeling that behaviour could rarely be predicted from attitude. In consequence psychologists came more to study *either* behaviour *or* attitudes and in general to avoid the question of how the two were related.

Of those interested in attitudes the academics have moved one way and the practitioners another. Academic studies have tended to be into the nature of, and the relationships between, attitude components and elements (Fishbein 1967; Insko 1967; McGuire 1969). Research has typically examined circumscribed and far from central attitudes, such as those towards tooth-brushing, extra-sensory perception, college fraternities and tuition fees. Detailed studies within apparently controlled experimental settings have been made of the microstructures and patterns-of-change of attitudes of this type.

At the same time but without much cross-fertilization from the academic hothouse applied psychologists have grown quite a different research plant. Their studies of attitudes to work have been of two kinds. Most have been atheoretical, being concerned to map out and to describe in terms readily understood by industrial sponsors the content of employee attitudes; we thus have many projects aiming to determine what percentage of people in a given age range or in some other category are 'fairly satisfied' or 'very satisfied' with features of their job. The other type of attitude study has been directed to theory, but over a narrow range—Herzberg yes or no? Lines are now firmly marked out (Grigaliunas and Herzberg 1971; Soliman

1970) and it may be thought that so blinkered a concern with theory will soon become as sterile as a complete absence of theoretical interest.

How then is the attitude field likely to develop? We anticipate an increasing overlap between the academic and the practitioner so that each incorporates into his repertory ideas and techniques from the other. The situation is ripe for the injection of a more general theoretical orientation and it seems possible that this will take the form of a restatement of the attitudes-and-behaviour question. Everyone recognizes that *some* attitudes predict *some* behaviour and the issue seems to be about the specification of levels of abstraction: do we look at overall, all-things-considered attitudes or at more specific ones (to the boss, to the conditions of work and so on)?

Another likely development in the study of attitudes which is suggested by changes in several branches of psychology is a move towards greater interest in the individual as he is at one point in time. Just as different people have different expectations of their job so it is apparent that what is important to an individual at one stage in his life is less important at another. A more individual-oriented study of attitudes to work which embraces an understanding of the sequential and possibly cumulative features of attitude development is one which will have to emerge. The conceptual and measurement problems facing us are considerable.

Organizational Structure

One aspect of a person's outlook on his job which is relatively unchanging is the degree of his preference for a structured, rules-oriented organization (Adorno *et al.* 1950; Gordon 1970). Institutional authoritarianism of this kind is negatively associated with the amount of education which a person has received, and as our earlier discussion suggests there is a hint that future generations will prefer work organizations which are flexible and where roles are not too firmly defined. This change is already under way and reflects a movement evident in our society as a whole.

Yet we should hesitate before assuming that progress in this direction will continue at an uninterrupted pace and before accepting Bennis's predictions about the "demise of bureaucracy and the collapse of management as we know it" (Bennis 1967, p. 577). There are several reasons why these are unlikely to be fulfilled. In the first place flexibility and freedom of choice are associated with personal anxiety and uncertainty, and both managers and workers are limited in how much anxiety over long periods they can tolerate. On a rather different level institutional authoritarianism increases with age, so that a stabilizing factor is always present in the older and more powerful members of an organization. This factor tends to become particularly influential in times of economic stress; stringency encourages increasing centralization and control from the top. Furthermore we have already noted that organizational size is likely to continue increasing, and it is established that large organizations tend to require more formalization for their continued operation (Pugh *et al.* 1969).

It is probable that many commentators' suppositions about the likely decline of structured institutions have arisen partly from wishful thinking and

partly from a somewhat unsophisticated interpretation of observed correlations. The behaviour described as participative, democratic, power-equalizing, supportive, consultative, cooperative, open, non-authoritarian, liberal, sharing and so on are in general positively valued by most currently popular writers on organizations. They have observed changes towards their own values, and with firm empirical support from studies like that of Likert (1961), they project still more movement in their favoured direction.

Yet there are plausible statistical and intuitive reasons for supposing that the relationship between degree of organizational authoritarianism and effectiveness (however defined) is a non-linear one. Management behaviour which is *very* authoritarian and which completely constrains subordinate freedom is clearly less effective than that which is more participative, but this is not to say that every shift towards the participative end of the continuum yields an increase in effectiveness: there is in most settings a point on the continuum beyond which a shift is maladaptive. The existence of such a point is not made explicit in the usual research designs and correlational analyses.

These several arguments suggest that progress towards less authoritarian structures will continue, but that it will before long lose its momentum. What then can the psychologist-consultant advocate? 'Increased participation' or 'less authoritarian management' will no longer serve as his customary recommendation and he will need another theoretical foundation on which to build his professional advice. He might work with a job enrichment philosophy (Paul and Robertson 1970) which certainly holds promise in some circumstances. But its appropriateness is mediated by technological, social and financial variables of several kinds, and job enrichment as a widespread recommendation is likely to yield diminishing returns over the next decade or so.

Perhaps our salvation will come from where it properly should come—mainstream psychological theorizing. We began this article by observing how the problems facing the occupational psychologist of the future are inextricably linked with the problems facing society as a whole. Perhaps we should end by noting that the development of his work is also closely tied in with the development of his mother-subject and consider what particular changes in psychology are likely to influence the occupational psychologist.

The trend today is quite clear—psychology is becoming much more concerned with people and the practical problems they experience. This is in spite of the rapid developments which are likely to take place in biology (Kay 1971) and which will profoundly influence the development of physiological psychology. The trend to expect more of psychologists who are facing everyday social and industrial problems will accelerate. Within psychology there are several different approaches which coincide in their strong emphasis on 'the person', and which will be both directly and indirectly influential. We have in mind here the recent developments in personal construct theory (Bannister 1970), in forms of humanistic psychology (Bugental 1967; Severin 1965), in the self theory of Rogers (1961) and in the phenomenological implications of existential psychology (May 1969). One does not

have to accept these doctrines in their totality to recognize that they are likely to permeate our science in one form or other.

These changes will be aided by a growing disaffection among psychologists themselves. Much professional introspection is reaching the conclusion that psychology has been too much focused on problems arising from the laboratory and not enough based upon issues arising from the real world. This is a view which many British psychologists who were trained under the influence of Bartlett will quickly recognize and accept (Warr 1971). The argument gains in strength as time passes and the problems of community life seem themselves to become generally more pressing.

Another, rather different, feature tending towards the development of a more 'humanized' psychology is the growth of interest in multivariate research paradigms. Over a broad front research workers are becoming keen to avoid the simple two-variable study and to introduce instead several interacting variables into their investigations. As they do this (aided by their newly-found computer power) so do they regularly turn to individual-difference variables. A straightforward and theoretically-fruitful design is one which observes the effect on a dependent variable of changes in experimental condition and in subject characteristics. This paradigm is, of course, suitable in field research (accidents as a function of job content and personality differences for instance), but its significance for the present argument derives especially from its laboratory application.

What is happening here is that psychologists who are 'experimental' in the restricted sense of the term are broadening their outlook to acknowledge that personality attributes are measurable and are legitimate objects of study. Within the academic culture it is these experimental psychologists who set the climate of teaching and establish the value systems of most of the able students. As they and their colleagues are drawn more into investigations of the person so will the undergraduate training of psychologists slowly change. We believe that this change will in time reduce the gulf which at present separates the average academic and his occupational counterpart. In line with our thinking in an earlier section we hope that the middle-aged members of the profession will present themselves for retraining without too much reluctance!

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PROFESSIONAL REGISTRATION OF OCCUPATIONAL PSYCHOLOGISTS: SEPARATE OR CONJOINT?*

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"A LARGE NUMBER OF PERSONS seem to be of opinion that the State is bound no less to take care of the general public, than to see that it is protected against incompetent persons, against quacks and impostors in general. I do not take that view of the case. I think it very much wholesomer for the public to take care of itself."

That utterance of a liberal philosophy was made by T. H. Huxley in 1884 speaking as a member of the Royal Commission on Registration of the Medical Profession.

"In my judgement," he continues, "the intervention of the State in the affairs of the medical profession can be justified not upon any pretence of protecting the public, and still less upon that of protecting the medical profession, but simply and solely upon the fact that the State employs medical men for certain purposes and, as any employer, has a right to define the conditions on which it will accept service. It is in the interest of the community that no person shall die without there being some official recognition of the cause of his death; it is a matter of the highest importance to the community that in the civil and criminal cases the law shall be able to have recourse to persons whose evidence may be taken as that of experts; and it will not be doubted that the State has a right to dictate the conditions under which it will appoint persons to the vast numbers of naval, military and civil medical offices directly or indirectly under the Government. Here, and here only, it appears to me lies the justification for the intervention of the State in medical affairs."

Twenty-eight years previously, and just over a hundred years ago, John Simon, as Medical Officer of the General Board of Health, had listed some of the objects which he thought members of the profession desired to see realized by legislation (Heseltine 1949). They included: the legal definition of a medical practitioner, the requirement that only such practitioners should be held competent to hold medical appointments, to give medical certificates or to sue for fees for medical attendance; that an authentic register of legally

*Shortened version of the Chairman's address to the Annual Conference of the Occupational Psychology Section of the British Psychological Society held at Churchill College, Cambridge, on 2 January 1970.

qualified practitioners should be published annually; that it should be an offence for any person "falsely to assume a title or description" implying him to be a legally qualified person; and that the names of persons "guilty of certain disgraceful offences" be removeable from the register. These, broadly, were what in due course were achieved.

But Simon went on to insist that the "legally qualified medical practitioner" should be a "well qualified medical practitioner" and gave reasons why he did not consider this condition to be satisfied at the time. He pointed to the innumerable and unco-ordinated bodies—twenty-one, including the Archbishop of Canterbury—who could give licences for practice; to the varying standards required and, hence, the preference among candidates for the easiest; and, above all, to the results of a survey he had conducted in 1856 which showed that some one and a half thousand of the seven and a half thousand members of the Royal College of Surgeons of England possessed no second title and might, therefore, be unable to offer any guarantee of competence in the practice of medicine or midwifery or pharmacy. Conversely, a similar proportion of Licentiates of the Society of Apothecaries of London were apparently unpossessed of any diploma to guarantee their knowledge even of the rudiments of surgery. It was one of the primary objects of the first Act of 1858 to remedy this particular situation (Heseltine 1949).

Here are three issues: how far should the law interfere with people's freedom to seek advice from anyone they choose? How far can such a law be enforced, bearing in mind that an unenforceable law is a bad law? How can we bring together skills and areas of knowledge that should never be separated in any field of practice? These are three issues which faced the medical profession a hundred years ago—and still face it—and I believe that they are very like those we face today in considering registration of occupational psychologists.

At the National Institute of Industrial Psychology we come across a variety of examples of bad practice in the name of occupational psychology. Moreover, our avowed objects of developing teaching, practice and research in the *application* of occupational psychology has made us sensitive to the ethical problems that arise in practice. The questions we are asked often involve matters of ethical importance and we often have to refuse to undertake tasks that are not in our view in the best interests of people. The experience leaves us anxious about the good name of occupational psychology and the results that could follow the loss of that good name.

There is an agency which offers vocational advice based on the professed belief that abilities must follow interests and, in this belief, uses no tests for assessing its clients' abilities or achievements nor, so far as we can gather, considers a client's potential future change of interests or of problems. One student of a 'crammer' described how he and his colleagues worked from 8.30 a.m. to 9.00 p.m. to obtain the 'O' levels that their parents worshipped. "All have reports with charts," he said, and the reports, it seemed, were from this agency. The parents were mostly overseas. One wonders whether this is not a method better suited to satisfying the aspirations of the parents rather than the real needs of their children.

One respected journal reported a new test to be undergoing experimental trials. When we asked the test agents for evidence of the test's reliability and validity in order to assess its value, we were told that it was a private test and that no evidence of this kind was yet to hand. But the test was already upon the market and, if there was no evidence of its worth, would seem to have been there on false pretences. Other similar examples have come to our notice.

We now have computer people eager to fill spare niches in their tapes with test scores and other personal information apparently with no awareness either of the technical uses and abuses to which selection data can be put or of the demands of confidentiality. A paper published in a computer journal some time ago proposed that successful managers should be given a biographical inventory and a battery of tests so as to obtain profiles of what the company required. The same test battery would then be given to applicants and the computer would match the profiles to select those to be called for interview. Leaving aside the obvious questions of reliability in comparing the scores of the successful and well entrenched with those of applicants or of the statistical validity of assessments made on differences of test scores, what better method could be found for perpetuating a type and of ensuring a company's rigidity and probable extinction?

It seems we need a representative body of practitioners able to warn against the misapplication of misunderstood research. I suggest we need one, too, to protect us from those manpower planners whose mathematical models of humanity sometimes seem to have such small relation to the stuff of which humanity is made.

Switching briefly from fitting men to jobs to improving the jobs and environments that people work in, some such body is overdue if only to inform journalists or captains of industry that attitude surveys are not a recent American invention, and to point out some of the cautions to be observed in using them.

Finally, I suggest we need a representative body of practitioners for ourselves, able to advise, guide and perhaps sometimes chasten us when we inadvertently bring practice in our subject into disrepute.

Occupational psychologists at the present time need to be rather a mixed bag of specialists, of vocational advisers, selectors, management consultants, trainers and semi-ergonomists. It may be that each sees its own examples of bad practice but does not see the whole for lack of a body surveying the whole. This alone may be one of the best reasons for forming such a body.

Replies to the questionnaire sent to members of the Occupational Psychology Section of the British Psychological Society showed a great majority to be in favour of professional registration although a substantial number questioned whether it should be tied to the B.P.S. I believe that a tie with the B.P.S. may be a necessary short-term measure. But I also believe that one tie is not enough and that, in the long term, we shall have to work towards a register of practitioners governed by a council of practitioners drawn at least from the ranks of ergonomists and sociologists as well as

occupational psychologists and having as criteria for entry all the essentials, not just of knowledge, but of the skills required for practice.

I have been harping on the word practitioner because, as I understand it, this is what registration is about. It is a matter of ensuring that people are reasonably competent to exercise their craft upon the public. In this matter the three questions that faced the medical profession a hundred years ago seem to me the three important questions that face us now. How far should the law interfere with people's freedom to seek advice from anyone? How far could such a law be enforced? How can we bring together knowledge and skills that should never have been separated?

There are dangers in laws which try to protect too much and closed shops are liable, for lack of opposition, to become institutions governed by people who have reached their level of incompetence. They run the risk of rigidity in the approaches to our subject which could, in the long term, harm the public as much as it might protect it in the short term. But any such protective law would be impossible to enforce. Alternative advisers would not disappear and their official banishment would only remove them still further from the little guidance we can hope to offer now. The risks of rigidity in thinking and of driving non-conformists underground seem to me to be important dangers.

I have heard some people say that they would like the very word 'psychologist' protected by law. But no one is prevented in this country from calling himself doctor whether he has a doctorate of Philosophy, of Science, of Divinity, or of nothing. Conversely, all physicians call themselves 'doctor' for convenience although the vast majority have no doctorate at all. The surgeons, who have passed the same first qualifying examinations, firmly call themselves 'Mister' as soon as they get their Fellowship to mark their honourable descent from barbers.

The matter of registration seems to me to be quite otherwise. In essence, it is but a development of the mediaeval guilds which formed to protect their members and their members' customers. They set standards but did not say that others could not practise. This is fair: show you have something better to offer and let the customer decide. The law, as I understand it, says only that false claim to membership is fraud. If an employer, private or the State, chooses only to employ the members of a guild, so much the better for the guild. A Division of Occupational Psychology may be able to perform the functions of a guild for our immediate needs. But I want to urge that this is not sufficient for the future.

Before the Second World War what was then known as industrial psychology was devoted to applying the principles of anatomy, physiology, psychology and sociology to the problems of working life. What is now called ergonomics was born and grew in that period and what is now called industrial sociology came to be an important ingredient in the mix as well. The rapid development in the study of machines and their environments which took place during the Second World War and the enthusiasm with which sociologists followed the beckoning of Hawthorne led to such vigorous growth in both these subjects that the British Psychological Society could not contain them.

But members of the Ergonomics Research Society, who have no difficulty in defining the boundaries of their subject for teaching and research, are finding, as they are bound to find, that when it comes to practice they cannot ignore selection, training, supervision, management, while satisfaction must be included among criteria. Certainly, any evaluation of what has been applied must take account of all these things as well.

Sociologists who apply their arts in practice are, in their turn, also finding that human groups are collections of individual people whose anatomies, physiologies and psychologies cannot be totally ignored.

An ergonomist who looks only at the ergonomic aspects of his client's problem will do some clients a disservice. A sociologist who looks only at the social aspects of his client's problem can harm him just as easily. It is as wrong for psychologists to ignore the ergonomic and the social aspects of the problems that they deal with. The psychologists may even be in worse case, since so many specialize in one or another field of occupational psychology. A selector, for example, may overlook the training aspects of a problem or fail to examine a company's payment and promotion systems although improvements in them might alter the whole selection outlook.

Fields which already overlap in theory are indivisible in practice. I go so far as to say that no first diagnosis of a problem should ever be made by specialists unless they have had some basic training in the art of assessing all the factors that affect behaviour at work on the one hand and people's suitability for different forms of work on the other. This seems to me to be an absolute need if we are to protect our clients from our natural tendency to prescribe the remedy we happen to be able to offer when another might be better.

The argument I have heard that these other bodies have not enough psychology to do a decent job of practice is irrelevant. They will practise, come what may, and it will do no one any good to stand aside and so ensure they get no psychology at all.

The argument that many problems really call for project teams containing representatives of different disciplines is attractive at first sight but refers mostly to large problems and those already well defined. You cannot say to a managing director of a smallish company despairing of its labour turnover: "Wait till I assemble my little army of operational researchers, ergonomists, sociologists, psychologists and statisticians and it will cost you five times as much as if I just had a look at your problem by myself."

If we go on as we are going now, we shall soon have just that multiplicity of licensing authorities which the General Medical Council in its time took so long to unify. We, too, for failure to get together, will have registers of sociologists, economists and operational researchers with little or no leavening of psychology, ergonomists with insufficient knowledge of sociology and occupational psychologists perhaps relegated to administering selection tests.

Consider also what would happen if we as psychologists attempted to broaden the training of our own members, as indeed we should. We might well have to ask the help of other bodies to define the minimum training

in their fields that we should need—even ask them to appoint examiners—and they, in their turn, might ask us to do the same. Either each would turn against the other and produce a war to the detriment of all our reputations or all would have to get together and admit that practice is indivisible.

Finally, I do not believe that it is the proper function of learned societies to govern practice. Their job is to promote knowledge, to specify criteria for examining people's possession of it and to promote research within their fields. Examining people's knowledge in the basic sciences is certainly part of the education necessary for practice and one that I am happy for learned societies to look after. But it is not the only part. A further problem which faced the medical profession a century ago was the realization that licences to practise could be obtained from many examining bodies without the candidate having had any clinical experience and without their examining his actual ability and skill in dealing with sick people. In our own case, the academic qualifications required for membership of the B.P.S. are no guarantee whatever of the holder's competence to practise in occupational psychology.

This is the crucial part of registration. Competence in practice demands training in practice and proof of competence demands assessment by people who are themselves practitioners. And competence in practice calls for that ability and skill in diagnosis that can look at all aspects of a problem before deciding on its nature and where best to apply treatment. It demands the same skill after diagnosis when choosing one among many possible forms of treatment in order to spot the particular circumstances which would make one or other form of treatment ineffective. These skills cannot be learned except in practice.

None of this affects the registration of psychologists as such, which I believe to be another matter altogether. My argument has solely to do with *occupational* psychology where the range of disciplines that must be called upon is so wide that we must, in my view, work towards a conjoint form of registration.

A conjoint register of practitioners will, of course, require some alteration in undergraduate teaching or the length of the course would be insupportable. Some subjects would need a little less attention than they get for honours degree purposes and some new subjects would need teaching, not as a speciality but to the level at which an investigator knows when to call in the specialist. A modicum of training in occupational hygiene, for example, would be one desirable addition. The analogy to medicine is helpful once again. No full degrees are required in anatomy, physiology, pathology, bacteriology, forensic medicine, surgery or midwifery and all the other bits and pieces on which the practitioner is examined for admission to the register.

This will all take time and will need a great enlargement in the facilities for supervised practical training. The NIIP has been exploring ways of accommodating undergraduate and postgraduate students as assistants and hopes to be of some help to those university departments that already give training in this field and also hopes that it can open up more facilities to help students of departments of psychology which do not give this training.

Let me finish by suggesting three steps that seem to me worth taking towards some form of registration of practitioners whose practice has to do with the problems of work and people at work.

First, let us form a Division that will specify the standards required of occupational psychologists as they are now. Let us hope that other bodies, the ergonomists and the sociologists in particular, will do the same in their fields. These bodies might then be seen as the equivalents of the Colleges of Surgery and Medicine and Obstetrics and the Society of Apothecaries and others as they existed in the past.

The membership of our Section is reasonably well scrutinized. I see no wrong as a second step in publishing a directory of their names and fields of practice if they wish to be included. I think a bold warning on the list that membership implies no assumptions of competence would be sufficient safeguard at this stage. Ergonomists and sociologists might do the same. There would then be three lists, with a considerable overlap at that, and the lists would be useful.

Publishing the lists would stimulate still more careful scrutiny of membership, and we would have the beginnings of a guild. Out of this greater care would come the criteria for admission to a register of practitioners in the future based on the experience of its practising members. I believe this evolution of standards from practical experience to be vital. Criteria will never be apposite or effective if thought up *a priori*.

In due course, with good will and more facilities for practical training, I believe that the representatives of the different disciplines will come together to determine the requirements of education and of training that will admit to some conjoint practising diploma or degree.

Some will see in this a pipe dream more suited to the theme of occupational psychology in the 'nineties. Some will see it as a nightmare. But I shall now confess that I have had this pipe dream for a long time. I remember trying to express these general thoughts nearly twenty years ago but could find no name to give to the practitioner. But, if the right name still escapes me, the ecumenical zeal remains. I look forward to the day when practitioners belonging to many separate but overlapping disciplines may yet combine to form a common council suited to our purpose.

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